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Changing Patterns of Nonprior Service Attrition in the Army National Guard and Army Reserve

David W. Grissmer, Sheila Nataraj Kirby

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This report analyzes the attrition of Army Reserve and Army National Guard enlistees who have had no prior military service. It develops models of attrition that assign a probability of attrition to each recruit type. The models are based on analyses of historical attrition for the fiscal year 1980-1982 cohorts entering the Army National Guard and Army Reserve. The report focuses on separations to civilian life and develops separate models for attrition during the training and posttraining periods and the first two years after enlistment. A major finding is that economic factors and institutional policies are extremely important determinants of attrition across different cohorts. Although it is possible to predict the relative attrition risk associated with changes in composition or quality, the predictive power of such models is not good. As much as possible, changes in component policies or training standards must be accounted for, as well as the effect of changing economic conditions on both the entering cohorts and the component.

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Changing Patterns of Nonprior Service Attrition in the Army National Guard and Army Reserve

David W. Grissmer, Sheila Nataraj Kirby
with Priscilla M. Schlegel

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PREFACE

This research was sponsored by the Office of the Assistant Secretary of Defense (Reserve Affairs) under RAND's National Defense Research Institute, a Federally Funded Research and Development Center supported by the Office of the Secretary of Defense. It was prepared within RAND's Defense Manpower Research Center.

This report analyzes the attrition of Army Reserve and Army National Guard enlistees who have had no prior military service. It develops models of attrition that assign a probability of attrition to each recruit type. The models are based on analyses of historical attrition for the fiscal year 1980-82 cohorts entering the Army National Guard and Army Reserve. The report extends previous work at RAND on reserve attrition by the authors (R-3267-RA, *Attrition of Nonprior-Service Reservists in the Army National Guard and Army Reserve*, October 1985). The present report focuses on separations to civilian life and develops separate models for attrition during the training and posttraining periods and the first two years after enlistment.

The report should be of interest to those who recruit, retain, and manage personnel in the Selected Reserve Forces. Since it specifically uses experience from the Army National Guard and Army Reserve, policymakers at the Army Recruiting Command, the Deputy Chief of Staff for Personnel of the Army, the Director, National Guard Bureau, and the Chief, Army Reserve, should find the work of most interest.



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SUMMARY

This report analyzes the attrition of selected reservists in the Army National Guard and Army Reserve who enter the reserve without prior military service. A substantial training investment is required to teach these individuals basic military skills and military occupations. This investment occurs during approximately eight weeks of basic military training, an Advanced Individual Training (AIT) course which takes from one month to over a year, and the resources at the unit level required to perform on-the-job training (OJT). The return from this investment occurs as the individual serves the normal six-year term of reserve service.

The longer the individual stays—provided performance is satisfactory—the better the return on the training investment. Attrition of these individuals to civilian life before completion of the term can substantially reduce the return to this training investment. Our previous analysis of the FY80 entrance cohort (Grissmer and Kirby, 1985) showed separation rates during the first two years of 30.6 percent for the Army National Guard and 39.5 percent for the Army Reserve. That study also showed that women had significantly higher attrition risk than men with similar characteristics, and that for both men and women, less education and lower aptitude scores led to much higher attrition risk.

Attrition patterns such as these convinced the services to put increased emphasis on recruiting more highly educated individuals with higher aptitude scores. Enlistment bonus payments and educational benefits were offered to higher-quality recruits, the number of recruiters was increased, and their reward structure was geared toward recruiting higher-quality individuals. These policies, along with higher civilian unemployment rates, were successful in increasing the number of higher-quality recruits in FY81 and FY82. For example, the percentage of enlistees who were high school graduates increased from 53.3 percent to 71.6 percent in the Army Reserve and from 68.2 percent to 71.2 percent in the Army National Guard, from FY80 to FY82.

This study extends our earlier study by analyzing attrition for three cohorts: FY80, FY81, and FY82. It analyzes the consistency of attrition behavior and policies over time. Since the time period chosen includes dramatic changes in enlistment quality and composition and equally dramatic shifts in economic conditions, the data allow the exploring of several attrition hypotheses previously untested. These

include the effects of unemployment shifts on attrition, the effects of service policies and planning on attrition, and the efficacy of increased recruiting resources. This last hypothesis is the subject of a forthcoming report.

Our study identifies three types of attrition from the Selected Reserve components that must be treated separately if our concern is return on training investment. Some reservists leave to enter the active force, some leave only to return to the Selected Reserve at a later time, and others return to civilian life. We receive a return on training investment if individuals enter the active or the reserve. These two categories of reserve attrition accounted for 20 to 30 percent of two-year attrition for the Army Reserve and 10 to 15 percent of attrition in the Guard. Failure to distinguish among these types of attrition will overstate the magnitude of the reserve attrition problems. In this report we focus on attrition to civilian life.

The results show that higher enlistment quality did not reduce attrition to civilian life; attrition actually increased significantly in the higher-quality cohorts, particularly for the Army Reserve. These results are very similar to those regarding active duty first-term attrition; the latter also declined as the quality of the entering cohorts increased (Buddin, forthcoming). Civilian attrition rates during the first two years of service increased from 25.4 to 31.6 percent for the Army National Guard and from 28.3 to 37.7 for the Army Reserve. For the Guard, this rising level of attrition was mainly accounted for by higher levels of attrition during training; the Army Reserve experienced increases in both training and posttraining attrition.

We can advance three possible explanations for this finding. First, attrition discharge policies and training and performance standards may change from one year to the next shifting the overall level of attrition. For instance, our results show quite different attrition probabilities for similar individuals entering in different cohorts. A very high-quality male enlistee (Category II with high school degree) entering the Army Reserve who is white, single, and 18 to 20 years of age had an estimated two-year probability of attrition to civilian life of 0.16, 0.22, and 0.25 in FY80, FY81, and FY82, respectively. These differences suggest that training standards may have been tightened or easier discharge standards implemented during this time period.

Training standards may have shifted from FY80 to FY82 because the services responded to an easier recruiting environment by tightening standards and "creaming" the best from any cohort regardless of cohort quality. This "creaming of cohorts" may be a conscious, opportunistic policy that allows the Army to always obtain the best of the available pool of enlistees. The reasoning is that with better enlistees

available, replacement of marginal accessions is less costly, and very high-quality cohorts enter the trained force. This policy would mean that training and performance standards vary from one year to the next, depending on accession quality.

On the other hand, unintentional tightening of training standards would occur if training performance of recruits was simply "graded on the curve" so that a relatively fixed proportion of recruits was discharged regardless of quality. Higher-quality cohorts would then lose the same proportion of accessions as lower-quality recruits. If this were to occur, a closer coordination of recruiting and training policy would be required to take advantage of higher-quality cohorts.

Changes in discharge standards at the unit also appear to have affected posttraining attrition for the Army Reserve. Strong evidence shows that a policy shift to a more lenient discharge policy for unit commanders in the Army Reserve—so-called "wrench up"—was implemented at this time. This may help explain the sizable increase in attrition in the FY82 cohort.

Another hypothesis consistent with the results is that rising unemployment and increased recruiter resources and emphasis brings in enlistment cohorts with *unmeasured* characteristics that increase attrition risk. The marginal recruit who joins because of enlistment bonus payments, more intense recruiting, or poorer civilian job prospects may have markedly different attrition propensities than an otherwise similar enlistee. This could happen simply because the marginal enlistee within any quality category would have less "taste" for the military, have more potential conflicts with employer or family, or be more risky in terms of psychological or social profile. This would mean higher attrition in later cohorts, for whom unemployment at entrance was higher.

There is a reverse side to this argument. As unemployment falls, more job changes and migration may cause higher attrition for enlistees in the posttraining period. Unemployment fell in 1983 and 1984—a period when the FY82 entrance cohort was making posttraining enlistment decisions. This hypothesis would fit the Army Reserve attrition pattern. However, Guard posttraining attrition did not rise during this period, which makes this hypothesis less tenable.

The results from the FY81 and FY82 cohorts with respect to attrition risks of different quality groups tend to support the FY80 results. The characteristics that are strongly and consistently related to attrition do not change over time. Recruiting and training policies can thus be developed with respect to these characteristics with a fair degree of confidence that these results will hold over time. Relative attrition can generally be predicted with some degree of accuracy on the basis of gender, educational achievement, aptitude scores, race, and age.

The characteristic that makes the largest consistent difference in attrition risk is gender. Women are at much higher risk of attrition than males with similar characteristics. However, the gap between male and female attrition narrows somewhat between FY80 and FY82 for both the Guard and reserve. In the FY80 cohort for the Guard, a typical female enlistee had a two-year civilian attrition of 44 percent compared with 18 percent for a similar male. In the FY82 cohort, the corresponding attrition rates are 44 percent and 28 percent.

There are several explanations for higher attrition risks for women. Women may break reserve commitments more often because they migrate more often and change jobs and marital status more frequently than men of similar age. Moreover, both marriage and jobs for women may more frequently lead to conflicts with the reserve commitment. Marriage will more often conflict with reserve service because of pregnancy and greater responsibility for home and children. Women may also encounter more job conflicts with the reserve commitment because of more frequent weekend work and less control over work schedules and hours.

Moreover, women may be less prepared by previous experience than men for meeting physical training standards in basic training and may also be less prepared for skill training if nontraditional skills are chosen by women. In terms of our theory, women will encounter more "experience" characteristics on the reserve job than men. Thus, the decision to join the reserve is less grounded in known experience and poses more uncertainty and will be more easily reversed.

The characteristics that account for the next largest consistent differences in attrition are education and aptitude category. The direction of these effects is similar for men and women—more education and higher aptitude are associated with lower attrition probabilities. Depending on the gender and cohort, a change from not having to having a high school diploma usually results in a relative decrease in attrition of 25 to 75 percent. Higher mental category, as measured by a high score on the Armed Forces Qualification Test (AFQT), also significantly reduces attrition for both high school graduates and nongraduates.

The three remaining variables—race, age, and marital/dependency status—show much smaller influences on attrition and generally affect attrition somewhat differently for men and women. Race usually does not significantly affect attrition risk for men; black women, however, have significantly lower attrition than nonblack women. The effect of changing age from younger to older increases attrition risk for men—by a fairly sizable proportion in the Guard. For women in the Guard, age matters much less than for men; in the Army Reserve, women over 20

have a lower attrition risk than those ages 18 to 20 or age 17, although the differences are small. Finally, the effect of changing marital status or dependency status hardly changes men's attrition risk, but being married either with or without dependents usually increases women's attrition risk by moderate amounts.

Developing improved attrition models requires work in several areas. First we need to identify and track important manpower policy changes that can directly and intentionally influence attrition levels. These policies include training standards, attrition discharge policies, and binding budget and end-strength constraints.

It is also important to better understand possible unintentional changes or adjustments that occur when enlistment cohort size or quality changes. Changes in cohort size and quality can bring different unmeasured characteristics that change expected attrition levels. The adjustment of the training process to cohorts of different sizes and quality is another poorly understood area.

Finally, we need to better understand the effects of changing economic conditions on reserve attrition. Changing unemployment can change the characteristics of incoming cohorts and can directly affect attrition through civilian job opportunities. For instance, there may be more job mobility during times of falling unemployment as reservists move up from entry-level jobs to higher paying and more secure jobs. Such changes would be expected to increase attrition levels.

Three research approaches would prove useful in sorting out these issues. First, analysis of additional cohorts would probably be able to untangle the effects of unemployment. Analytical approaches incorporating survivor functions would be helpful in this process.

A longitudinal survey of reservists at entry with periodic follow-ups would also be helpful to register important variables on civilian life. Such an effort would probably involve collecting data from exiting reservists as well. Such data could also better document the circumstances of individuals who leave and return—an important part of reserve attrition.

Finally, it is currently not known how many individuals who leave would have stayed and performed well under slightly different training circumstances. Training schedules offer little flexibility to adapt to recruits with different problems. Some structured experimentation with more flexibility in training schedules and regimens might have large payoffs in terms of retaining a larger proportion of each cohort. Structuring such experiments during the training process and following recruits would be fairly easy.

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CONTENTS

PREFACE	iii
SUMMARY	v
ACKNOWLEDGMENTS	xi
TABLES	xv
Section	
I. INTRODUCTION	1
II. A THEORY OF RESERVE ATTRITION	5
General Framework for Attrition Decisions	5
Identifying the Set of Alternatives	6
Voluntary and Involuntary Job Separation	8
Hypotheses	14
III. PATTERNS OF ATTRITION, FY80-FY82 COHORTS ...	18
Data Source	18
Demographic Profiles of Army National Guard and Army Reserve Enlistments, FY80-FY82 Cohorts ..	19
The Timing of Separation	20
Losses Who Join the Active Force or Return to the Reserve	23
Differences in Composition and Attrition Patterns by Sex	25
IV. MULTIVARIATE ANALYSES OF TWO-YEAR ATTRITION	29
Statistical Model	30
Specifying the Variables	31
Empirical Results	32
Analyzing the Timing of Attrition	40
Predicting Cohort Attrition	46
V. SUMMARY AND FUTURE RESEARCH	53
Summary of Attrition Risks	53
Predicting Cohort Attrition	59
Differences Between the Army Guard and Reserve in Attrition Effects	60
Future Research	60

Appendix: LOGISTIC REGRESSION COEFFICIENTS FOR THE ARMY NATIONAL GUARD AND ARMY RESERVE ATTRITION MODELS	63
BIBLIOGRAPHY	73

TABLES

2.1.	Probability of first marriage, by sex, age group, and race	10
2.2.	Separation rates from full-time job, by sex, age group, and race	11
3.1.	Demographic composition of Army National Guard, FY80-FY82 nonprior service cohorts	19
3.2.	Demographic composition of Army Reserve, FY80-FY82 nonprior service cohorts	21
3.3.	Two-year attrition rates of Army National Guard and Army Reserve, FY80-FY82 nonprior service cohorts, by timing of loss	22
3.4.	Two-year attrition rates of Army National Guard and Army Reserve, FY80-FY82 nonprior service cohorts, by timing and destination of loss	24
3.5.	Demographic composition of Army National Guard, FY80-FY82 nonprior service cohorts, by sex	26
3.6.	Demographic composition of Army Reserve, FY80-FY82 nonprior service cohorts, by sex	27
3.7.	Two-year civilian attrition rates of Army National Guard, and Army Reserve, FY80-FY82 nonprior service cohorts, by timing of loss and sex	28
4.1.	Two-year Reserve attrition probabilities: losses to civilian life among males in the Army National Guard, FY80-FY82	34
4.2.	Two-year Reserve attrition probabilities: losses to civilian life among males in the Army Reserve, FY80-FY82	36
4.3.	Unemployment conditions for three enlistment cohorts . . .	37
4.4.	Two-year Reserve attrition probabilities: losses to civilian life among females in the Army National Guard, FY80-FY82	38
4.5.	Two-year Reserve attrition probabilities: losses to civilian life among females in the Army Reserve, FY80-FY82	39
4.6.	Pretraining and training Reserve attrition: losses to civilian life among males in the Army National Guard, FY80-FY82	41

4.7. Pretraining and training Reserve attrition: losses to civilian life among males in the Army Reserve, FY80-FY82	43
4.8. Posttraining attrition to civilian life among males in the Army National Guard, FY80-FY82	45
4.9. Posttraining attrition to civilian life among males in the Army Reserve, FY80-FY82	47
4.10. Pretraining and training Reserve attrition: losses to civilian life among females in the Army National Guard, FY80-FY82	48
4.11. Pretraining and training Reserve attrition: losses to civilian life among females in the Army Reserve, FY80-FY82	49
4.12. Posttraining attrition to civilian life among females in the Army National Guard, FY80-FY82	50
4.13. Posttraining attrition to civilian life among females in the Army Reserve, FY80-FY82	51
4.14. Actual and expected attrition rates, FY81 and FY82 cohorts, using FY80 coefficients	52
4.15. Actual and expected attrition rates, FY82 cohort, using FY81 coefficients	52
5.1. Estimated civilian attrition probabilities during initial two years of service for men and women with similar characteristics	54
5.2. Estimated civilian attrition probabilities during initial two years of service for men and women differing in educational attainment	55
5.3. Estimated civilian attrition probabilities during initial two years of service for men and women differing in aptitude attainment	55
5.4. Estimated civilian attrition probabilities during initial two years of service for men and women differing in race	56
5.5. Estimated civilian attrition probabilities during initial two years of service for men and women differing in age	57
5.6. Estimated civilian attrition probabilities during initial two years of service for men and women differing in marital status	57
5.7. Estimated two-year civilian attrition probabilities for single white males and females with specified characteristics	58

A.1.	Logistic regression coefficients for Army National Guard two-year attrition model: losses to civilian life among males, FY80-FY82 cohorts	63
A.2.	Logistic regression coefficients for Army Reserve two-year attrition model: losses to civilian life among males, FY80-FY82 cohorts	64
A.3.	Logistic regression coefficients for Army National Guard two-year attrition model: losses to civilian life among females, FY80-FY82 cohorts	65
A.4.	Logistic regression coefficients for Army Reserve two-year attrition model: losses to civilian life among females, FY80-FY82 cohorts	66
A.5.	Logistic regression coefficients for Army National Guard pretraining and training attrition model: losses to civilian life among males, FY80-FY82 cohorts . . .	67
A.6.	Logistic regression coefficients for Army Reserve pretraining and training attrition model: losses to civilian life among males, FY80-FY82 cohorts	68
A.7.	Logistic regression coefficients for Army National Guard posttraining attrition model: losses to civilian life among males, FY80-FY82 cohorts	69
A.8.	Logistic regression coefficients for Army Reserve posttraining attrition model: losses to civilian life among males, FY80-FY82 cohorts	70
A.9.	Logistic regression coefficients for Army National Guard pretraining and training attrition model: losses to civilian life among females, FY80-FY82 cohorts	71
A.10.	Logistic regression coefficients for Army Reserve pretraining and training attrition model: losses to civilian life among females, FY80-FY82 cohorts	72

I. INTRODUCTION

The Selected Reserve components recruited and trained approximately 103,000 nonprior service enlisted reservists in FY87. Approximately 75 percent of these enlisted in the Army National Guard or Army Reserve (Assistant Secretary of Defense, 1986). Each enlistee requires a significant recruiting and training investment to become fully qualified in a military occupational specialty. The training investment consists of the costs of recruiting and processing the individual, providing pay and training resources during 8 to 11 weeks of basic training followed by a period of Advanced Individual Training (AIT), and finally using unit resources for on-the-job training (OJT) during his initial period with the unit.

It takes a minimum of 12 weeks of full-time training to complete basic and the lower-skill AIT courses. For higher-skill courses the training takes longer and in certain skills can last up to a full year. The period of OJT is also variable but probably lasts for at least the first few months of unit drills and sometimes much longer. The marginal costs of producing trained and fully qualified soldiers vary by skill but range from a minimum of \$5,000 to over \$20,000 per individual.

The return from this training investment normally occurs as the individual serves his term of Selected Reserve service and the remaining period of military obligation with the Individual Ready Reserve (IRR). Currently the normal Selected Reserve enlistment term for nonprior service individuals is six years, and an overall eight-year military obligation is incurred. This means that in a normal tour an individual will serve six years in the Selected Reserve and two years in the IRR. Individuals serving fewer than six years in the Selected Reserve will incur corresponding longer commitments in the IRR unless discharged for unsatisfactory service.

This return can be substantially reduced if individuals leave before their committed term of service. Grissmer and Kirby (1985) showed that individuals without prior military experience enlisting in the Army National Guard and the Army Reserve (referred to as nonprior service reservists) left at high rates before completing their six-year term of enlistment. Indeed, the analysis of the FY80 entrance cohort showed separation rates during the first two years of 30.6 percent for the Army National Guard and 39.5 percent for the Army Reserve.

Our analysis also showed that individuals who enter the reserve forces with higher levels of educational attainment and higher aptitude

scores on the Armed Service Vocational Aptitude Battery will have significantly lower levels of attrition during the first term of enlistment. For instance, a typical male enlistee in the Army National Guard, with a high school diploma, would have a 23 percent attrition rate in the first two years of service contrasted with a 35 percent rate for an enlistee without a diploma. Among high school graduates, those scoring in the highest aptitude group (Category I¹) would have two-year attrition rates of 18 percent contrasted with 29 percent for those scoring in the lowest aptitude group eligible for entrance to the armed services (Category IV). The direction and significance of education and aptitude in determining attrition held for both males and females and for both the Army Reserve and Army National Guard (Grissmer and Kirby, 1985).

Attrition patterns such as these convinced the services to shift their recruiting emphasis to higher-quality recruits through the use of such policies as paying enlistment bonuses to higher-quality recruits, increasing the number of recruiters, providing recruiters with incentives for recruiting higher-quality enlistees, and providing expanded postservice educational benefits for such enlistees. These policies, along with higher civilian unemployment rates, were successful in increasing the number of higher-quality recruits in the Army Reserve components between FY80 and FY82. For example, the percentage of enlistees with high school diplomas increased markedly from 53.3 percent to 71.6 percent in the Army Reserve. The Army National Guard experienced a smaller increase, from 68.2 percent to 71.2 percent.

The expected payoff from higher-quality cohorts has two components. First, higher-quality recruits might lower cohort attrition levels. If individuals stay longer, then future accession requirements decline. Significant reductions in future recruiting and training costs can occur from lowered accession requirements. This latter effect is to be distinguished from the effect of lower attrition on accession requirements mentioned above.

A second payoff from increasing enlistment quality is improved unit readiness. This improved unit readiness occurs because the performance of average individuals in the unit is higher. Average individual performance can be increased in three ways by higher-quality individuals. First, those with higher aptitude and education will learn skills faster. Second, they will probably also achieve higher levels of long-

¹Recruits are classified into percentile groups labeled Category I, Category II, Category IIIA, Category IIIB, Category IV, and Category V mental groups, based on scores received on the entrance examination (Armed Forces Qualification Test, or AFQT). Categories I, II, and IIIA are above average; IIIB, IV, and V are below average. Category V personnel are ineligible for entrance to the Armed Forces.

term productivity. Third, they will stay longer resulting in the average soldier having more experience on the job.

To what degree these potential benefits of higher-quality recruits are actually captured depends on certain manpower policy decisions, and specifically, on whether the behavior of higher-quality recruits has been properly integrated into the manpower planning system. Some of the benefits can be lost without adequate planning and good policy decisions.

If the planning needed to accommodate lower attrition within estimated end-strength and budget ceilings is either not done or not done with sufficient accuracy, such benefits can be seriously curtailed. Congressionally imposed end-strength ceilings and annual budget appropriations are based on estimates of attrition, retention, and accessions; inaccurate estimates may require significant adjustments in manpower levels—especially near the end of the fiscal year. Careful planning is especially required when economic conditions change, for example. Higher unemployment may increase retention rates for individuals beyond their first term. If this higher retention is not integrated into budgetary plans and end-strength estimates, then pressures could develop to change accession or early attrition policies to accommodate higher retention.

Such adjustments are likely to be made by changing early attrition levels. Newly recruited groups are the largest and easiest to adjust in the short run to achieve end-strength ceilings and stay within budgetary levels. However, such adjustments can partially negate the beneficial effects of recruiting higher-quality individuals.

Lack of coordination between recruitment and training policies may also partially revoke the benefits of higher-quality recruiting. If training and performance standards are "graded on the curve," then higher-quality cohorts will lose the same proportion of enlistees as a result of "inadequate performance" as lower-quality cohorts. Especially during boot camp and AIT, there may be a tendency to judge performance relative to others in the group and always to fail a constant proportion of the group. If this occurs, then it inadvertently results in partial loss of the benefits of higher-quality recruiting. This might be avoided by coordinating the quality of arriving groups with training discharge policies and informing training instructors of the quality of the incoming cohorts.

However, this "creaming of cohorts" may also be a conscious, opportunistic policy that allows the Army to always obtain the best of the available pool of enlistees. This would mean that training and performance standards vary from one year to the next depending on accession quality. For instance, as unemployment increases and the

enlistment pool grows, the Army can either maintain standards and increase the flow of individuals in the trained force or raise standards and maintain the flow of individuals while increasing quality. The first option emphasizes lowering manpower costs; the second emphasizes raising force effectiveness through improved individual quality.

Besides policy and planning procedures, there is an alternative reason why the expected benefits from higher-quality recruits may not be obtained. The marginal recruit who joins because of enlistment bonus payments, more intense recruiting, or poorer civilian job prospects may have markedly different attrition propensities than an otherwise similar enlistee. For instance, he may differ with regard to taste for military service. Thus, the expectation of lower attrition based on models drawn from historical data may not be fully realized.

This report begins to address these more complex attrition questions by analyzing nonprior service attrition from the Army Reserve and Army National Guard for three enlistment cohorts: FY80, FY81, and FY82. It analyzes the consistency of attrition behavior and policies over time. Since the time period chosen includes dramatic changes in enlistment quality and composition for the reserve and equally dramatic shifts in economic conditions, the data allow the exploring of several attrition hypotheses previously untested. These include the effects of unemployment shifts on attrition, the effects of service policies and planning on attrition levels, and the efficacy of increased recruiting resources. This last hypothesis is not dealt with in this report; it will be the subject of a subsequent paper.

It is clear that attrition across several cohorts can best be explained by a mix of several factors: demographic variables (incorporating recruit quality), economic variables (to capture the effect of civilian job opportunities for reservists), and institutional variables (to account for the interrelationship between training standards and other manpower system objectives). Section II presents a theory of attrition that attempts to integrate these factors and testable hypotheses deriving from the theory. Section III compares basic attrition patterns for the FY80, FY81, and FY82 cohorts. Section IV compares the FY80-FY82 attrition patterns using logistic regression techniques to control for the changes in the composition of the enlistment cohorts. Section V provides conclusions and recommendations.

II. A THEORY OF RESERVE ATTRITION

GENERAL FRAMEWORK FOR ATTRITION DECISIONS

Attrition and enlistment decisions represent choices made by individuals and reserve components¹ at different points in time. At the time of enlistment, the individual chooses reserve service over alternative secondary activities, such as a part-time civilian job or leisure activity. The reserve component similarly decides in favor of enlisting the individual. Attrition from reserve service indicates that the preferences of one or both parties have changed and that separation is regarded as the appropriate choice.

A theory of reserve attrition needs to identify the changes that cause the enlistment decision to change to a separation decision for either party. Ideally, the theory should be able to determine the frequency of such changes for individuals with different characteristics and with different reserve and civilian life experiences to develop hypotheses regarding attrition for such individuals.

Our theory assumes that individuals facing choices in their use of time allocate time among primary jobs, secondary or moonlighting jobs, schooling, family, and leisure time. They choose among a set of feasible alternatives on the basis of how they perceive the characteristics of these alternatives and how they value them. They choose the alternative with the highest utility.

Presumably, single enlistees base their decisions on their own self interest. For married reservists, however, the decisionmaking process needs to be viewed from a family perspective. Moonlighting jobs tend to compete with family or leisure time and may restrict spouses' working opportunities. Such a perspective helps highlight an important set of changes in family structure that may lead to reserve separation. These include marriage, divorce, birth of children, and spouse entry into the labor force. All these are likely to cause enlistees to reevaluate their reserve commitment and possibly to eventually separate.

Similarly, the reserve component faces choices among different potential enlistees and chooses enlistees on the basis of perceived characteristics and their perceived value. Assuming rational behavior on the part of the service, enlistees who are perceived to offer the greatest net contribution to readiness will be given enlistment contracts provided their perceived marginal contribution to readiness exceeds the marginal cost.

¹Refers to both the Army Reserve and Army National Guard.

We can identify several classes of changes that can cause a reversal of the enlistment decision. These can be broadly categorized as follows:

- New information regarding characteristics of the reserve job or the reservist;
- Changes in the valuation placed on such characteristics;
- Emergence of new alternatives for either the individual or the component; and
- Changes in the decisionmaking environment, such as family structure and geographical location.

These are clearly not mutually exclusive categories.

IDENTIFYING THE SET OF ALTERNATIVES

For the Reservist

Both primary and secondary labor force activities must be considered in identifying alternatives to reserve participation because of the strong interaction between primary and secondary activities. Certain full-time jobs might exclude moonlighting; others may make it fairly easy. For instance, full-time jobs requiring work on weekends can deter reserve enlistment. Coordination is especially required at the enlistment point because of the initial requirement for at least four months of full-time training. Unemployed candidates would find this training easier to arrange than would those working full-time jobs, although it may be easier to obtain extended leave from certain kinds of full-time jobs.

Alternatives to a reserve enlistment might then include:

- Working a particular civilian full-time job with no moonlighting;
- Working a particular civilian full-time job and another moonlighting job;
- Working a part-time job;
- Being unemployed and continuing to search for a full-time job;
- Being a student (this might include working at a full- or part-time job or not working); and
- enlistment in the active force (which excludes reserve enlistment).

For a married reservist this set must be expanded to include joint decisionmaking regarding the primary and secondary labor force status of both husband and wife.

Following economic theory, we hypothesize a utility function for the individual that allows him to value characteristics of these alternatives jointly and to arrive at an overall evaluation for each alternative. Such characteristics would include pecuniary and nonpecuniary job benefits from the primary and secondary activity, working hours, the value of training opportunities (and related future income), available leisure time, and the interactions between primary and secondary jobs. For instance, reserve service includes the requirement to attend training for two full-time weeks in the summer. Military income during this period often *replaces*, not *augments*, civilian income. Viewing the primary and moonlighting job characteristics separately in this situation would overvalue the moonlighting income.

Besides the usual list of nonpecuniary benefits associated with jobs (job security, satisfaction, relationship with coworkers, etc.), nonpecuniary characteristics peculiar to the reserve job must also be considered. These include the legal term of commitment (usually six years), the possibility of mobilization with associated risks, and the unique training and camaraderie usually associated with military service.

There are certain transaction costs attendant on separating from the reserve, such as the possibility of dishonorable discharge. This might make future employment more difficult. We assume that these are also factored into the evaluation by the individual comparing reserve and other alternatives.

For the Army

For the reserve component, the alternatives to enlisting an individual are:

- Enlisting a different individual; and
- Leaving the position vacant.

The reserve component, in its decision calculus, compares the individual's performance and contribution to unit readiness against the wages and benefits necessary to retain the individual. Ideally, the component will make discharge decisions whenever replacement can result in improved readiness at similar costs or equal readiness at less cost (in both cases taking account of the transaction costs of the replacement, such as separation costs paid and training costs for another individual). It may also decide against replacement if productivity of the alternative enlistees available does not exceed costs.

Having identified alternatives and characteristics for both enlistees and the component, we turn now to analyzing voluntary and

involuntary job separation decisions and the types of changes likely to govern reserve attrition.

VOLUNTARY AND INVOLUNTARY JOB SEPARATION

Voluntary Separation—The Reservist's Decision

Elementary models of the labor market assume that workers and firms have perfect knowledge of the market and the environment in which their decisions are made. More sophisticated models focus on the uncertainty and lack of complete information that more accurately characterize the decisionmaking process.

New Information and Reevaluation After Job Acceptance. These latter models (Lippman and McCall, 1979) attempt to explain the separation decision in terms of individual uncertainty, incomplete information, and dynamic job search processes. Employees are frequently uncertain about the alternatives facing them, the possibility of additional offers, and the consequences of their decisions; additional information and possible offers can be acquired but only at a cost. This cost includes the costs of obtaining better information about current offers, searching for additional offers, as well as the lost wages from not accepting current offers.

As such, decisions to accept a job are made in a dynamic environment. Because of search costs, it is not optimal to wait until all offers are available or all alternatives identified. As a result, contacts made during the job-search process may result in additional job offers subsequent to the initial decision. A separation decision can then be viewed as the consequence of rational decisionmaking in which the initial decision based on incomplete search is overturned as better jobs become available or known.

Using a different albeit not altogether dissimilar approach, experience models (Nelson, 1970; Pencavel, 1972) posit the existence of unobservable characteristics of the job that can be learned only through experience on the job. In these experience models, then, jobs have two classes of attributes: inspection (or search) characteristics, which can be observed directly or without actually consuming the "good," and specific (or experience) characteristics, which become evident only through actual experience. The acceptance of any job is conditional; if the jobholder finds the value of the experience attributes (about which he was imperfectly informed) below some critical level, he will quit.

We pointed out in an earlier report (Grissmer and Kirby, 1985) that several aspects of holding a reserve job may be classified as experience attributes: regimentation and competition of military life, physical conditioning, group living, living away from home, handling the demands of two jobs, etc. These experience attributes can either cause the individual to consider separation, or if particularly valued, may serve to reinforce the individual's taste for the military, leading to reserve separation in favor of a full-time military career.

These concepts of job search and experience attributes, originally developed to explain separations from full-time jobs, also apply to moonlighting jobs, but in a more complex way. Moonlighting jobs also entail job searches and have experience characteristics that can trigger dissatisfaction and cause separation.

However, the moonlighting job can also be at risk from search and experience characteristics on the full-time job. Quitting a full-time job because of search or experience characteristics may trigger separation from the reserve job also. This can occur if a new job requires geographical relocation or different work hours that conflict with the reserve work schedule, which requires 16 hours per month, typically on a single weekend; full-time annual training for two weeks during the summer, and an initial period of full-time training. Such an inflexible schedule makes reservists particularly vulnerable to conflicts between reserve obligations and civilian employer demands. Satisfactory resolution of such conflicts may be particularly difficult for young entrants into the full-time labor market.²

Another possibility is that reserve separation occurs simply because the individual did not anticipate the problems of handling both a full- and a part-time job. Handling and negotiating scheduling problems between the two employers is an important experience attribute of a moonlighting job; new labor force entrants may find this particularly difficult.

It is plausible that learning about both experience attributes and new job offers arising from the original job search occurs primarily during the early period of enlistment. Early attrition, then, may be caused mainly by these types of changes. Attrition in the later part of the enlistment term is probably caused mainly by the emergence of new job alternatives, changes in family structure, or geographical moves, described below.

Change in Marital or Employment Status or Residence After Enlistment. The reservist decides to enlist on the basis of labor

²Conflicts with the civilian employer have been shown to be one of the two leading causes of reservists leaving at the end of their term (Burrigh et al., 1982).

market information, marital status, and residence at the time of enlistment. Presumably, major conflicts with employers or spouses that might have prevented enlistment do not exist or have been satisfactorily resolved.

During the six-year period of enlistment, the enlistee's marital status, employer, or place of residence will likely change. Any one of these changes will cause the individual to reevaluate his commitment to the reserve job. Some data exist on the incidence of major changes in marital status, employment status, and residence location among various demographic groups.

Although approximately 85 percent of nonprior service enlistees are single when they enlist, many will marry before the end of their enlistment term. Table 2.1 shows the probability of a first marriage for young male and female Americans by age group and race. Approximately 30 percent of white males and 50 percent of white females marry between the ages of 18 and 24. Blacks have a somewhat lower marriage rate, with males and females following a pattern similar to that for whites.

It seems reasonable that a higher probability of a change in marital status will be associated with a higher probability of separation.

We have no direct evidence on the probability of moonlighting job changes by sex, age, or race. If, as seems likely, job separation leads to job search and the acceptance of another full-time job, then separation rates from full-time jobs would be a reasonable proxy for this variable. Table 2.2 shows clearly the large differences in separation rates from

Table 2.1

PROBABILITY OF FIRST MARRIAGE,
BY SEX, AGE GROUP, AND RACE

Sex and Age	White	Black
Males		
18 to 19 years	5.8	1.3
20 to 24 years	24.1	14.4
25 to 29 years	36.0	34.0
Females		
18 to 19 years	16.9	4.0
20 to 24 years	32.6	24.5
25 to 29 years	29.9	30.9

SOURCE: Bureau of the Census
(1982).

full-time jobs between 18- to 24-year-olds and 25- to 44-year-olds. Males and females differ surprisingly little, but blacks have lower separation rates than whites. Overall, separation rates decrease with age.

Higher separation rates may well be associated with higher attrition from the reserve if (1) the new job causes previously resolved conflicts to resurface or (2) if the new job requires relocation. Alternatively, the uncertainties and tensions inherent in any new employment may themselves cause attrition even without any direct or expressed employer conflict.

Moving also often entails reserve separation. The primary reasons for moving³ are economic—either to seek employment if unemployed or to move to better jobs if currently employed. Those having greater location-specific capital—years of experience on current job, local family ties, and home ownership—will move less frequently. Those who move once are more likely than nonmovers to move again, often back to the original home. Going away to college or receiving other postsecondary training is also a cause of residential change for this age group. The propensity to move varies in well-known ways for the general population. Migration rates peak among individuals in their early twenties and decline with age. Blacks migrate less frequently than whites. Individuals with higher educational attainment migrate more often than those with lower educational attainment. Migration is also closely linked to attainment of adulthood marriage and family formation, with the first few years after marriage being a period of frequent

Table 2.2

SEPARATION RATES FROM FULL-TIME JOB,
BY SEX, AGE GROUP, AND RACE

Sex and Age	White	Black
Males		
18 to 24 years	37.5	27.4
25 to 44 years	15.9	13.4
Females		
18 to 24 years	34.7	26.1
25 to 44 years	17.7	9.7

SOURCE: Bureau of Labor Statistics (1983).

³For review of migration determinants, see Morrison (1971); DaVanzo and Morrison (1982); and Goldscheider and DaVanzo (1985).

moves. Since women are more likely to leave parents' homes or to marry at younger ages than men, mobility rates among young women are likely to be higher than those among men. Reserve attrition should be lower for individuals who are characterized by stability in jobs, in marital status, and in geographical location during the term of enlistment.

Thus far, we have examined the attrition decision only from the reservists' point of view. We turn now to the other side of the picture and examine the separation decision from the Army's viewpoint.

Involuntary Separation—The Army's Decision

The traditional theory of the labor market depicts firms as being profit maximizers, possessing perfect information regarding the characteristics of all current and potential employees, and facing a stable, known product demand. Wage levels are established to clear the market and meet demand for each type of worker. Recent developments in the theory of the firm (Rosen, 1981), which recognize that this basic model is a severe abstraction, allow for employer uncertainty, imperfect information about workers, and screening among workers. Another focus is the transaction cost associated with recruiting, training, and separating workers and the cost of lost output from worker vacancies or marginal workers. The theories recognize that these costs are significant, and "optimal" hiring, screening, and separation policies must take them into account. However, recognition is also given to institutional constraints facing the firm, which may cause the firm to behave in less than optimal ways when hiring and separating workers.

These theoretical developments offer several useful insights when examining the decision by the Army to discharge recruits.

New Information and Reevaluation After Hiring. Assume for now that the Army offers a single market wage for all its recruits, regardless of quality. In the absence of bonuses, this assumption does indeed hold. Thus the Army has the incentive to recruit workers of the highest quality. For each vacancy, it is faced with a number of applications of varying quality. Each interview/test imposes lump-sum costs on the Army. It attempts to screen on the basis of characteristics known to be related to quality (education, scores on the AFQT, and physical health) and accepts recruits with a quality level above some minimum or "reservation level."

However, it is important to recognize that the reserve job requires certain skills and attitudes that cannot be measured completely by preenlistment screening. The Army uses the Armed Services Vocational Aptitude Battery (ASVAB) to predict cognitive trainability and

physical examinations to screen for physical trainability. However, both entrance tests are imperfect, and they cannot screen for important dimensions such as psychological adjustment to the military environment.

Similar to the unobserved experience attributes associated with a job discussed above, we can define two classes of employee characteristics. "Inspection" characteristics can be observed before hiring, whereas "performance" characteristics can be observed only while on the job. If the performance characteristics of the enlistee do not match certain standards, then involuntary separation or discharge occurs. This means that a two-tier screening process probably works best.

Preenlistment screening is done through aptitude testing and other observable and verifiable characteristics, but a second-tier screening is done during training and during the early enlistment period. During the course of this training, then, new information on the productivity and adjustment of the recruit may well lead the Army to choose discharge if this level is below its minimum "quality or performance" level ("reservation level").

The reservation quality level is directly related to attrition. A higher reservation level—other things equal—will bring higher levels of attrition. If this reservation quality level is itself not constant over time, this may help explain the changing attrition levels of different cohorts of enlistees.

Establishing reservation quality levels is a dynamic process that requires balancing the costs of periodic vacancies and lower productivity from marginal performers against the costs of replacement and higher output associated with higher-quality performers. However, replacement costs, vacancy costs, and the value of changed output are dynamic. They are likely to be a function of the prevailing competitive wage rates, current Army entrance wages and benefit levels, economic conditions and the associated availability of potential recruits, recruitment costs associated with further prospecting, separation costs, and the "price or value of defense output." As these conditions change, so too will the prevailing reservation quality level. Thus, cohort attrition can and, to be managed properly, should be dynamic. We hypothesize that both institutional and economic factors are likely to affect discharge policies and performance standards.

Institutional Factors and Changes in Economic Conditions. The supply of recruits to the Army Reserve is likely to be sensitive to economic conditions—particularly unemployment rates. We can then infer that the reservation quality established by the Army is likely to be a function of unemployment rates. When unemployment is high, recruiting and replacement costs are lower; thus the Army may well

raise its reservation quality level and increase attrition. However, in a growing economy, when replacement might conceivably be more difficult, the Army will choose to hold on to potentially marginal recruits.

Unemployment can have a secondary effect. Previous research (Grissmer et al., 1982) has shown that retention at first term and beyond is sensitive to unemployment rates. When unemployment is high, more reservists are likely to remain in service. If this higher retention is not anticipated, then personnel budgets and end-strength ceilings—that are planned and authorized as far as a year in advance—may be insufficiently flexible, and adjustments may need to be made late in the fiscal year either by reprogramming funds or reducing personnel. The latter adjustments are usually made through more liberal discharge policies for younger reservists, causing early attrition to rise.

In addition to the influence of changing economic conditions, budgets and end-strengths are subject to the vagaries of Congress and internal DOD and service politics. These can be broadly grouped as changes in "demand for defense services." Congress can, for instance, reduce end-strength, thus mandating personnel cuts and more discrimination in performance and training.

For instance, the Army may start a fiscal year with a certain recruitment goal and reservation quality level which is based on predicted economic conditions, budgets, and end-strengths established by Congress. If recruiting goes slower than expected, the Army may well decide to lower the reservation quality to fully use budgets, avoid vacancies, and meet end-strength levels. This lowering of reservation quality could occur either in the preenlistment or training screening process. In both cases, levels of attrition would be affected.

HYPOTHESES

A large gap exists between an articulated theory of reserve attrition and the data available to test hypotheses. The ideal data base would be longitudinally collected data on individuals who enlist in the reserves. Such data would encompass civilian life changes as well as military life variables. These data would also be supplemented by institutional data on attrition policies and other variables affecting attrition.

However, currently available longitudinal data have only a limited set of variables on individuals allowing only limited hypotheses testing. These data allow us to estimate only reduced-form versions of the full decision model we have described. In Sec. V, we discuss the

implication of our theory of reserve attrition and of our analysis for future research and data collection efforts. We discuss hypotheses relating to these variables here.

The theory outlined above highlights the fact that the attrition decision depends crucially on both the informed nature of the original enlistment decision and the probability of changes in employment, residence, household composition, and economic conditions after enlistment. Individual enlistees will vary with regard to the likelihood of these changes, and their attrition probabilities should vary likewise.

Unfortunately, the theory generates few unambiguous hypotheses, and empirical work is needed to determine the relative importance of the various factors. The following hypotheses are all of a *ceteris paribus* nature.

- *Women probably have higher attrition rates than men.*

Several factors put women at higher risk of attrition than their male counterparts. These factors tend to arise from the more traditional role of women in the household and may change as this role changes. Women are more likely to marry during the early years of enlistment and to migrate. Marriage often brings childbearing and greater child-rearing responsibilities than for men. It is likely that spousal conflicts may also be asymmetric and may be settled more often by female reserve separation, although no direct evidence exists on this point.

Other factors putting women at greater risk are the emphasis on physical conditioning during training, and, probably, a more difficult psychological adjustment to a military environment predominantly shaped and directed by males (Eaton and Nogami, 1981; Assistant Secretary of Defense, 1981).

Another factor may be the more limited choice of military jobs for women. The set of military jobs traditionally open to women is relatively circumscribed. Once these jobs are filled, women enlistees must choose more nontraditional jobs for which they may be less prepared, for which "experience" characteristics may occur more frequently, and for which current training procedures provide little room for adjustment.

A final factor may be that women working full-time jobs may more often run into scheduling and job conflicts than do men. This would hold if women more often work weekend schedules (such as in retail sales) or have more difficulty negotiating military leave for initial and annual training.⁴

⁴Employment statistics show that women are disproportionately employed in the sales and service occupations (including health-related occupations) that tend to have greater proportions of weekend schedules (Bureau of the Census, 1986).

Two factors that run counter to the above arguments are the lower wage rate and promotion opportunities for women in the civilian sector; this may argue for lower attrition among women. It has been shown that as individuals achieve greater income, moonlighting and reserve participation tend to decline (Shishko and Rostker, 1976; Burright et al., 1982). We believe that this effect is relatively small compared with the magnitude of the other factors discussed above.

- *Blacks should have a lower attrition rate than nonblacks.*

Other things equal, blacks exhibit a lower likelihood of geographical moves, job changes, and early marriage, all of which would predict lower attrition. This is reinforced by the lower wage rates, income growth, and civilian job opportunities for blacks.

- *Higher educational attainment and AFQT scores will probably lead to lower attrition.*

Better educated individuals and those with higher aptitude scores will more likely have made more informed enlistment decisions and have searched for alternatives more thoroughly. This would lead to lower attrition. Evidence from research on both active duty and reserve personnel provides ample support for this hypothesis. They also probably are less likely to marry during the term and may have more job stability (although they tend to move more). Countering this may be their greater earning power and promotion opportunity, which would lessen the need for reserve income. Nonetheless, the preponderance of evidence suggests lower attrition for this group.

Previous experience has shown that both educational attainment and mental ability are related to the productivity of recruits in important ways. For example, such high-quality recruits are more likely to meet the cognitive requirements of advanced individual training. Thus, the Army is likely to discriminate against lower-quality recruits, given the expectation of higher future costs associated with such recruits.

- *The effect of age on overall attrition is theoretically indeterminate.*

Older reservists would be more likely to make more mature, informed enlistment decisions based on a more thorough job-search process and a thoughtful evaluation of job and family demands. They might also tend to be more stable in a civilian job. However, these factors ignore the self-selection process that may tend to make these enlistees different from those who enlisted at earlier ages. For example, they may have had less success in civilian pursuits and have pursued military enlistment as a last resort.

There are other factors operating here as well. The probability of marriage increases for this older group (those 20 to 24). Civilian income is also presumably higher for older individuals, making reserve pay less important. Moreover, the physical rigors of training may well favor younger reservists.

- *The effect of changing economic conditions on reserve attrition is theoretically indeterminate.*

Changing economic conditions can change reserve attrition in two ways. First, they can change the characteristics of entering cohorts in ways that affect attrition levels. Second, they can influence experience by young enlistees in ways that could either increase or decrease the probability of attrition.

Individuals entering in times of higher unemployment may have different characteristics than those entering in better times. Other things equal, they are more likely to be unemployed, to have a lower taste for the military, and to be more risk-averse in any full-time job. These factors can push attrition in either direction depending on their strength.

Being unemployed at entrance, for instance, might bring a high attrition risk because of the self-selection occurring in the civilian labor market. It might also bring higher attrition risk from future full-time job conflicts when unemployment ends. However, for those employed at entrance, high levels of unemployment may bring more stability to full-time jobs and harder work at sorting out conflicts. Alternatively, when serious conflicts occur, they may be more often resolved by separating from the reserve job, since alternative civilian jobs are scarce.

The probability of changes in employment or location is likely to depend on economic conditions, albeit not in a simple way. More limited job availability may increase job and geographic stability among those employed. However, for those unemployed or with marginal jobs, the probability of moving (and thus attriting from the reserve) in search of employment may actually increase. These factors could push reserve attrition in either direction in response to economic changes; the total effect can be determined only empirically.

III. PATTERNS OF ATTRITION, FY80-FY82 COHORTS

This section presents an overview of the demographic composition of the FY80-FY82 cohorts and their attrition patterns both over time and by loss categories. Our earlier analysis had revealed marked differences in the attrition behavior of men and women enlistees; we found this to be true for the later cohorts as well. The last subsection, therefore, presents a profile of the male and female cohorts and disaggregated attrition statistics for the two groups.

DATA SOURCE

The primary data source for reserve personnel information is the Reserve Components Common Personnel Data System (RCCPDS) maintained by the Defense Manpower Data Center (DMDC). Begun in March 1973, the RCCPDS became the official source for reserve force inventory figures in July 1984.

DMDC has developed cohort files encompassing several fiscal years. Although these files include all six reserve components, we use only extracts for the Army Reserve and the Army National Guard, which together account for approximately 75 percent of all nonprior service accessions into the Selected Reserve.

The DMDC cohort file for each fiscal year contains the enlistment records, subsequent master file records, and loss records for all individuals who enlist. For the FY82 cohort, this file allows us to analyze attrition during the first two years. To keep the analyses comparable, only the first two years of data for each cohort are used.

For all individuals who generate a loss record, both the active and reserve accession records from the time of loss are searched to determine if the individual subsequently joined an active or reserve component (within two years). In this way the losses can be classified as losses to active components, to reserve components, or to civilian life.

DEMOGRAPHIC PROFILES OF ARMY NATIONAL GUARD AND ARMY RESERVE ENLISTMENTS, FY80-FY82 COHORTS

The Army National Guard enlisted approximately 50,000 nonprior service individuals in each of the three fiscal years. The demographic profiles of the three entrance cohorts are very similar (see Table 3.1). The enlistees from the three fiscal years are predominantly male (88 to 90 percent), single (85 to 86 percent), nonblack (79 to 80 percent), and 17 to 20 years of age (75 to 79 percent). The educational and aptitude

Table 3.1

**DEMOGRAPHIC COMPOSITION OF ARMY NATIONAL GUARD,
FY80-FY82 NONPRIOR SERVICE COHORTS**
(In percent)

Variable	FY80	FY81	FY82
Sex			
Male	90.4	89.6	88.4
Female	9.6	10.4	11.6
Race			
Black	20.3	20.6	20.5
Nonblack	79.7	79.4	79.5
Age at enlistment			
Less than 18 years	27.3	29.0	26.6
18 to 20 years	51.2	48.7	48.7
21 years or older	21.5	22.3	24.7
Marital status			
Single, no dependents	85.2	85.9	85.0
Single, with dependents	4.1	3.7	3.5
Married, no dependents ^a	4.5	4.2	4.4
Married, with dependents	6.2	6.2	7.1
Education			
High school graduate	68.2	67.5	71.2
High school nongraduate	31.8	32.5	28.8
AFQT score^b			
Category I	2.9	2.8	3.1
Category II	18.8	19.1	20.8
Category III	68.1	64.4	64.0
Category IV	10.5	13.7	12.1
(N)	48,823	49,769	50,151

^aA spouse is not considered a dependent.

^bAFQT scores have not been renormed for the FY80 cohort.

profiles of the three cohorts show a slight improvement from 1980 to 1982. The percentage of high school graduates increased from 68 to 71 percent, and the percentage scoring in the upper aptitude groups (Categories I and II) increased from 22 to 24 percent.¹

The Army Reserve dramatically increased the number of nonprior service accessions from approximately 25,000 to 34,000 between FY80 and FY82 (Table 3.2). The Army Reserve recruits also show a more discernible trend between FY80 and FY82 in their demographic, educational, and aptitude profile. The proportion of female enlistees declined slightly from 32 to 28 percent, and the proportion of black recruits declined from 31 to 24 percent. The proportion 17 to 20 years of age (75 to 77 percent) and the proportion not married (86 to 88 percent) stayed relatively constant. However, there was a marked shift in the percentage of high school graduates between FY80 and FY82, from 53 to 72 percent. This shift to better educated recruits shows up as a slight increase in higher-aptitude recruits (Categories I and II) and a decline in lower-aptitude recruits. However, renormed 1980 aptitudes would show a more dramatic shift downward between FY80 and FY82 in the percentage of Category IV recruits.

In contrast to Army Guard enlistees, Army Reserve enlistees had a much higher proportion who were female, a somewhat higher proportion of black recruits, and a slightly higher proportion of older enlistees (who are, not surprisingly, more often married). The FY80 and FY81 cohorts show Army Reserve enlistees to have less education and somewhat lower aptitude scores than Guard recruits, although these differences were virtually eliminated by FY82.

THE TIMING OF SEPARATION

Since reserve nonprior enlistees sign up for either three- or six-year terms, attrition during the first two years occurs before enlistees complete their legal obligation. Such attrition is labeled nonprogrammed attrition and can be initiated by the component because of performance falling below prevailing standards or by the individual. For attrition initiated by the individual, the component recognizes legitimate reasons for leaving such as geographical relocation, employer

¹At first glance, this appears to be contradicted by the slight increase in the proportion of Category IV enlistees. Unfortunately, the AFQT scores (from which these categories are derived) are not directly comparable. The FY80 scores need to be renormed to obtain an accurate and comparable distribution. We do not have data to allow us to do this. There is evidence to suggest that correct renorming would result in a large shift of individuals from Category III to Category IV in FY80 and that renorming would not significantly change the distribution between Categories I and II.

Table 3.2
DEMOGRAPHIC COMPOSITION OF ARMY RESERVE,
FY80-FY82 NONPRIOR SERVICE COHORTS
(In percent)

Variable	FY80	FY81	FY82
Sex			
Male	67.7	69.0	71.9
Female	32.3	31.0	28.1
Race			
Black	31.0	25.9	24.1
Nonblack	69.0	74.1	75.9
Age at enlistment			
Less than 18 years	24.5	27.1	26.2
18 to 20 years	48.2	47.5	48.1
21 years or older	27.3	25.4	25.7
Marital status			
Single, no dependents	86.4	88.1	88.2
Single, with dependents	0.8	0.8	1.1
Married, no dependents ^a	5.1	4.5	4.1
Married, with dependents	7.7	6.6	6.6
Education			
High school graduate	53.3	60.4	71.6
High school nongraduate	46.7	39.6	28.4
AFQT score^b			
Category I	2.8	2.3	2.2
Category II	18.1	19.3	21.5
Category III	62.4	54.3	62.4
Category IV	16.7	24.1	13.9
(N)	24,908	30,577	34,000

^aA spouse is not considered a dependent.

^bAFQT scores have not been renormed for the FY80 cohort.

conflicts, or health and hardship discharges. These individuals are given honorable discharges. Attrition for no legitimate reason may become evident only by absences from drills. Our data do not allow us to distinguish between such discharges; as a result, all are grouped together.

Nonprior service individuals enter the reserve and usually enter full-time training immediately. This full-time training consists of two months of general training (boot camp) and AIT in their particular military occupations. AIT is usually completed in a two- to three-

month period but may extend up to a year for certain skills. Upon completion of the full-time training, the individual returns to the unit where he works the normal reserve part-time schedule. This consists of two days of drills a month and 14 days of annual training. The latter period is usually 14 consecutive days of unit training during the summer months.

The components generally view the period of initial training as a screening period during which individuals who fail to perform adequately are dismissed. Ideally, screening during this period would enable discrimination between those who can or could perform adequately and those who either cannot or do not. In reality, screening procedures are imperfect, and individuals may be retained who perform poorly or individuals may be dismissed who could perform well. Component policies regarding leniency or strictness in training can place a greater (or smaller) burden on the units with regard to further winnowing of recruits.

We present attrition rates separately for the training and posttraining periods (Table 3.3). The posttraining period is divided into two categories: from the end of training to the first anniversary of enlistment and from the first to second anniversary of enlistment.

Table 3.3

**TWO-YEAR ATTRITION RATES OF ARMY NATIONAL GUARD
AND ARMY RESERVE, FY80-FY82 NONPRIOR SERVICE
COHORTS, BY TIMING OF LOSS
(In percent)**

Timing of Loss	National Guard			Army Reserve		
	FY80	FY81	FY82	FY80	FY81	FY82
Pretraining and training	18.8	23.8	25.1	8.9	13.9	12.9
Training to end of first year	1.9	1.5	1.0	10.8	10.2	9.2
Second year	9.9	9.8	9.0	19.8	19.7	24.6
Total	30.6	35.1	35.1	39.5	43.8	46.7
Remaining after two years	69.4	64.9	64.9	60.5	56.2	53.3
(N)	(48,823)	(49,769)	(50,151)	(24,908)	(30,577)	(34,000)

Overall, the National Guard separation rate increased from 30.6 percent in the FY80 cohort to 35.1 percent in the FY82 cohort. The majority of these losses (between 60 to 70 percent of the total) occurred during the pretraining and training period; this type of loss also accounts for the increase in overall attrition. The Army Reserve has considerably higher overall two-year separation and displays an increase from 39.5 to 46.7 over the three fiscal years. Much of this increase is due to an increase in training attrition, although the FY82 cohort also experienced a sizable increase in posttraining attrition.

The timing of the losses is strikingly dissimilar in the two components. The Guard has much higher training attrition and markedly lower posttraining attrition than the reserve. Since the Guard undertakes predominantly combat missions compared with the combat-support and training missions predominant in the reserve, this may reflect the different training and screening procedures used for different skills. It may also represent different training policies and standards in the two components. The reserve may place more emphasis on screening at the unit level, during on-the-job training, than the Guard. This may help explain the much higher reserve posttraining rates, evident in Table 3.3.

LOSSES WHO JOIN THE ACTIVE FORCE OR RETURN TO THE RESERVE

Our data allow us to distinguish between (1) losses who later join the active force or return to the same or another Selected Reserve component and (2) the remaining group whom we classify as losses to civilian life. A transfer to the active force may be considered by planners to be an asset to the total force instead of a loss. A loss to a Selected Reserve component brings more return on training investment than a loss to civilian life. From a total force perspective, then, we can treat separately losses to civilian life as "real" losses and those who later return to service as losses to the individual unit or component but not to the total force. However, from the point of view of the component, all losses represent a loss of training investment and all separations may be the more relevant category of analysis.

Table 3.4 disaggregates attrition both by destination and by timing of loss. Between 10 and 16 percent of Guard losses have joined the active force or rejoined the reserve within two years. Of those returning to the armed services, approximately three-quarters join the active force. The Army Reserve has a higher proportion of losses returning to join the active force or rejoin the reserve, between 20 to 28 percent.

Approximately two-thirds of those returning to the armed services join the active force. As one would expect, the return rate is much higher for those lost in the posttraining period. These individuals would more often be eligible to return, having successfully completed training, and would find entry into the active force easier.

As shown in Table 3.4, the Army Reserve loses a much higher proportion of its enlistees to the active force than the Guard. During the first two years of reserve service the Guard loses 2 to 4 percent of an entry cohort to the active force, whereas the Army Reserve loses 6 to 8 percent of an entry cohort to the actives. This probably reflects the fact that recruiting for both the Active Army and Army Reserve is done by the Army Recruiting Command, whereas the National Guard has a completely separate recruiting organization in each state. Army Reserve enlistees are thus more likely to know active recruiters, and these recruiters may actively pursue the reservists after they enlist. This may be particularly true when the active forces have slow recruiting periods.

Comparisons of attrition between the Guard and reserve without taking account of losses who subsequently join the active force or return to the reserve may be misleading. Although the overall two-year separation rate for the reserve is much higher than for the Guard, this difference narrows when only civilian attrition is considered. For FY80 and FY81, the reserve has only a slightly higher civilian loss rate; however, for FY82, the reserve civilian loss is significantly higher than the Guard's.

DIFFERENCES IN COMPOSITION AND ATTRITION PATTERNS BY SEX

As shown in Tables 3.5 and 3.6, the demographic characteristics, educational achievement, and aptitudes of individuals entering the National Guard and the Army Reserve show strong sex differences. For both the Guard and Army Reserve, women show much higher educational achievement and composite aptitude scores. These differences likely reflect the greater selectivity possible among women because of their more limited military job opportunities. Combat jobs are not available to women, and the aptitude requirements for the remaining jobs are likely to be higher.

Results from previous research indicate that—other things equal—higher educational achievement and aptitude usually mean lower attrition rates. However, one of the major inferences deriving from the theory of attrition delineated above was that men and women might

Table 3.5

**DEMOGRAPHIC COMPOSITION OF ARMY NATIONAL GUARD,
FY80-FY82 NONPRIOR SERVICE COHORTS, BY SEX**
(In percent)

Variable	Males			Females		
	FY80	FY81	FY82	FY80	FY81	FY82
Race						
Black	19.5	19.4	19.0	29.8	30.7	32.5
Nonblack	80.5	80.6	81.0	70.2	69.3	67.5
Age at enlistment						
Less than 18 years	28.1	30.1	27.7	19.1	19.8	18.2
18 to 20 years	52.0	49.3	49.0	44.1	43.8	46.6
21 years or older	19.9	20.6	23.3	36.8	36.4	35.2
Marital status						
Single, no dependents	85.3	86.2	85.2	84.2	83.7	83.8
Single, with dependents	4.1	3.7	3.3	3.8	4.0	4.6
Married, no dependents ^a	4.3	3.9	4.1	6.3	6.3	6.2
Married, with dependents	6.3	6.2	7.4	5.7	6.0	5.4
Education						
High school graduate	66.7	65.8	69.4	82.8	81.6	84.5
High school nongraduate	33.3	34.2	30.6	17.2	18.4	15.5
AFQT score^b						
Category I	2.5	2.4	2.8	6.4	4.4	4.1
Category II	17.5	18.7	20.9	25.7	22.9	21.3
Category III	69.2	65.0	64.1	61.7	61.3	63.1
Category IV	10.8	13.9	12.2	6.2	11.4	11.5
(N)	44,170	44,611	44,325	4,651	5,158	5,826

^aA spouse is not considered a dependent.

^bAFQT scores have not been renormed for the FY80 cohort.

have different attrition patterns because of differing marriage and migration patterns. Women also are more likely to separate because of pregnancy and family responsibility.

Two-year civilian attrition rates—unadjusted for male and female differences in education, aptitude, and age—differ markedly between males and females, as shown by Table 3.7. We find that over 40 percent of women joining the Guard leave for civilian life within two years; the corresponding rate for males is between 24 and 30 percent. For the reserve, the difference in attrition rates is much smaller; indeed, by FY82, the civilian attrition rates are almost equal.

Table 3.6
DEMOGRAPHIC COMPOSITION OF ARMY RESERVE, FY80-FY82
NONPRIOR SERVICE COHORTS, BY SEX
 (in percent)

Variable	Males			Females		
	FY80	FY81	FY82	FY80	FY81	FY82
Race						
Black	28.0	21.4	19.8	37.2	35.8	35.0
Nonblack	72.0	78.6	80.2	62.8	64.2	65.0
Age at enlistment						
Less than 18 years	28.3	31.3	29.8	16.5	17.6	16.9
18 to 20 years	50.0	48.7	48.9	44.7	44.9	46.2
21 years or older	21.7	20.0	21.3	38.8	37.5	36.9
Marital status						
Single, no dependents	88.8	90.0	89.6	81.3	83.7	84.8
Single, with dependents	1.0	0.9	1.1	0.2	0.6	1.2
Married, no dependents ^a	3.7	3.2	3.2	8.2	7.4	6.2
Married, with dependents	6.5	5.9	6.1	10.3	8.3	7.8
Education						
High school graduate	47.1	53.5	36.1	66.3	75.6	91.3
High school nongraduate	52.9	46.5	63.9	33.7	24.4	8.7
AFQT score^b						
Category I	2.5	2.6	2.3	3.4	1.7	2.0
Category II	13.9	19.4	20.8	26.8	19.2	23.4
Category III	64.9	54.9	61.3	57.5	52.9	65.1
Category IV	18.7	23.1	15.6	12.3	26.3	9.5
(N)	16,845	21,096	24,432	8,061	9,481	9,568

^aA spouse is not considered a dependent.

^bAFQT scores have not been renormed for the FY80 cohort.

The higher training attrition in the Guard may be partly explained by the more rigorous AIT required of guardsmen and the fact that the Guard includes many more nontraditional specialties where women may find themselves at a disadvantage (Table 3.7).

Two further points are of interest when comparing the male and female trends across the cohorts. First, the civilian attrition rate for both men and women has increased from FY80 to FY82, although the increase in the male attrition rate is much more dramatic. Second, the increase for the Guard cohorts is attributable to an increase in training attrition; for the reserve, it is attributable to increases in both training and posttraining attrition.

Table 3.7

**TWO-YEAR CIVILIAN ATTRITION RATES OF ARMY NATIONAL
GUARD AND ARMY RESERVE, FY80-FY82 NONPRIOR
SERVICE COHORTS, BY TIMING OF LOSS AND SEX
(In percent)**

Sex and Year	Timing of Loss		Total
	Pretraining, Training	Post- training	
Army National Guard			
Male			
FY80	16.3	7.6	23.8
FY81	21.3	8.2	29.5
FY82	22.6	7.6	30.2
Female			
FY80	32.0	8.4	40.4
FY81	36.7	7.9	44.6
FY82	36.8	6.1	42.9
Army Reserve			
Male			
FY80	6.1	19.3	25.4
FY81	10.3	20.8	31.1
FY82	10.7	26.6	37.2
Female			
FY80	10.1	24.1	34.2
FY81	12.8	25.1	37.9
FY82	13.2	25.5	38.7

IV. MULTIVARIATE ANALYSES OF TWO-YEAR ATTRITION

This section presents multivariate models of attrition that allow one to estimate the probability of attrition for enlistees with a specific set of characteristics. Models are presented for the Army Guard and reserve for three enlistment cohorts; they are estimated separately for men and women. For each enlistment cohort and gender group, models are developed for attrition in three time periods: during pretraining and training, during posttraining, and during the first two years of enlistment.

Two types of conclusions are possible from these estimates. First, comparing the structure of two attrition models tells us whether attrition patterns and attrition determinants are similar across groups. For instance, comparing models for men and women allows one to make conclusions regarding the similarity of factors influencing attrition. Similar comparisons can be made between the Guard and Army Reserve, for training and posttraining attrition, and for enlistees in different cohorts.

The second type of conclusion comes from using each model to estimate attrition probabilities for enlistees with different characteristics. The characteristics included in the model are:

- Education—high school graduate versus nongraduate;
- Race—black versus nonblack;
- Age—17, 18-20, and 20+;
- Mental aptitude—AFQT Categories I, II, III, IV; and
- Marital and dependency status—single with and without dependents, married with and without dependents.

From the standpoint of the Army, these models can be used to develop improved screening criteria for recruits. Comparing attrition probabilities also allows one to estimate the relative attrition difference that would result should recruit characteristics change. In particular, they can be used to compare expected attrition effects from higher-quality cohorts. Perhaps as important, the models can be used to monitor the consistency and gauge the effects of component attrition policies over time provided that unmeasured factors remain unchanged across different cohorts. Policymakers can determine if higher-quality cohorts actually bring lower attrition and can determine if certain

manpower policies—such as preenlistment screening—are affecting attrition levels.

STATISTICAL MODEL

Empirically, the attrition process is summarized by a dichotomous dependent variable that categorizes individuals as stayers or leavers. The outcome variable is defined as:

$$Y_{it} = 0, \text{ if individual } i \text{ stayed through time period } t, \text{ and} \\ 1, \text{ if individual } i \text{ separated during time period } t.$$

Models were estimated for three time periods: (1) $t = 1$, pretraining and training period; (2) $t = 2$, posttraining period extending from the end of training to two years from date of enlistment; and (3) $t = 1 + 2$, first two years from date of enlistment, combining the two time periods. Of course, any individual who separated during the pretraining-training period was clearly not faced with the choice of staying or leaving during the posttraining period. Such individuals were automatically excluded from the posttraining attrition model.

The logistic regression (logit) model is an appropriate choice for the functional form, since it restricts the value of the predicted probability to between zero and one. This model relates the separation decision of the i^{th} individual, Y , to a vector of characteristics for that individual, x_i . The assumed relationship is:

$$Y_i = p(x_i) + \epsilon_i,$$

$$P(x_i) = P[Y_i = 1 | x_i]$$

$$= \frac{1}{1 + e^{-(\beta_0 + \sum \beta_j x_{ij})}}$$

where $P(x_i)$ = probability of attrition of a specific reservist i ,

x_{ij} = values of the explanatory variable j for reservist i ,

β_j = estimated coefficients for the x_j ; and

β_0 = estimated constant term.

Two estimation methods are commonly used to estimate the parameters in studies of this type: conditional maximum likelihood estimation and discriminant function analysis. Since several empirical stu-

dies report similar estimates with both methods,¹ we chose the cheaper discriminant function method.²

SPECIFYING THE VARIABLES

We adopt a total force perspective and focus on the group for which training investment losses are largest: losses to civilian life.³ This was done because civilian losses constitute a very large share of losses, and patterns and determinants of losses among the remaining categories are not sufficiently different to change key results. Our FY80 analysis (Grissmer and Kirby, 1985) showed similar results for total losses and civilian losses. In the FY81 and FY82 cohorts, losses to the active service and returns to reserve service constitute an even smaller share of total losses, thus the results should remain relatively unaffected.

The patterns and reasons for civilian loss should be different depending on the timing of the loss. In our theory we had hypothesized that performance and experience attributes would dominate early attrition, but policy changes, mobility, and employer and family conflicts may dominate later attrition. Hence we model early

¹See Haggstrom (1983); Chow and Polich (1980); Halperin et al. (1971).

²The logistic attrition model is

$$\ln \left[\frac{P(Y_i)}{1 - P(Y_i)} \right] = x\beta;$$

i.e., the natural logarithm of the odds ratio is a linear function of x . The estimated coefficients can be derived by rescaling the ordinary least squares (OLS) coefficients relating Y and x . In other words, one simply computes a linear probability function by regressing Y_i on x_i , using OLS. Then one can obtain the discriminant function estimates α and β as:

$$\beta = (n/SSE)\beta$$

$$\text{and } \alpha = \log(P_1/P_2) + [(n/SSE)(\alpha - 0.5)] + \left[\frac{n(n_1^{-1} - n_2^{-1})}{2} \right]$$

where α, β = the OLS intercept and estimated coefficient terms;

n = number of observations;

SSE = residual sum of squares from the OLS regression;

n_1 = number of observations for which the dependent variable has the value 1;

$n_2 = n - n_1$;

P_1 = proportion of individuals in target population for which Y has the value 1. (If observations are drawn at random from the target population, one can estimate P_1 using n_1/n , and $P_2 = 1 - P_1$.)

³However, there are also legitimate reasons for developing models of total losses. One main reason is to predict more accurately losses from a component for better control of end-strength and budgets.

and later attrition separately. We define early attrition as occurring during the pretraining and training period, with late attrition occurring after the individual completes training and joins the reserve or Guard unit.

Besides discovering different influences in the training and post-training period, we want to analyze the timing of attrition so that questions of efficiency regarding attrition policy can be addressed. For individuals who cannot meet training performance standards, early attrition will minimize training investment, and the presence of unproductive individuals will not impair unit readiness. However, identifying such individuals is uncertain, and training attrition policies can be lenient or strict with respect to that uncertainty. Strict policies run the risk of separating individuals who might later be productive. Lenient policies risk allowing individuals to stay who might subsequently leave after an unproductive period with the unit. Establishing a balanced attrition policy requires empirical evidence from both the training and posttraining periods.

The independent variables available for this analysis were limited to those available on the military personnel record. These include educational achievement, race, sex, component, age, mental aptitude, marital status, and number of dependents.

The theory of reserve attrition developed above points to a number of other variables that probably influence attrition. The most important of these would include variables describing labor force status, civilian income, and characteristics of the civilian job market at enlistment and throughout the term. It would also include migration information, marital and dependency status changes,⁴ and various experience attributes of particular units.

Collecting such data requires an expensive longitudinal survey of a sample of reserve enlistees. Before such an undertaking it is useful to determine how much of the variance in reserve attrition can be explained by the present set of variables.

EMPIRICAL RESULTS

Since discriminant function regression coefficients have no easy interpretation, the results are transformed and presented as attrition probabilities. These probabilities are calculated from the regression coefficients, using the equation shown above, and represent a

⁴At first glance this information would seem to be available from military personnel records. However, the marital status and dependency status for reservists is collected at enlistment and not updated regularly.

convenient and useful summary of the regression model effects. The logistic regression coefficients are given in Appendix A. We present results for two-year attrition first, followed by results for the training and posttraining periods.

Two-Year Attrition: Males

Table 4.1 presents estimation results of the two-year attrition models for males in the Army National Guard for each of the three cohorts. The table entries are estimated attrition probabilities for an individual with the designated characteristics. In this and subsequent tables, a reference individual is defined and the attrition probability calculated for that individual. Attrition probabilities are then calculated for an individual who differs from that reference individual in *one* characteristic, *holding all others constant at the reference category values*.

For instance, the first column of Table 4.1 gives the attrition probabilities for a typical FY80 male in the Guard. The attrition probability is 0.18 for the reference individual who is a single, nonblack, high school graduate, 18 to 20 years old, and in Category III. If that individual were black instead of nonblack, but had all the other characteristics, the attrition probability would be 0.23.

For the FY80 cohort, the largest difference in attrition obtains between high school graduates (18 percent) and nongraduates (31 percent). Statistically significant and large differences also occur in attrition rates by mental categories, age, and race. The presence of dependents at enlistment makes no significant difference in attrition, although being married without dependents results in a small, statistically significant increase in attrition. Among interaction terms tested, high school nongraduates who are black have a significantly higher attrition rate (35 percent) than high school nongraduates who are not black (31 percent).

It is interesting to compare the similarities and differences in attrition trends across the three entrance cohorts. There is remarkable consistency—except for the influence of race—in what influences attrition across the cohorts. In each cohort, the influence of education, age, and aptitude category shows large, statistically significant effects on attrition behavior. Moreover, the difference in attrition caused by these variables is very similar across cohorts.

The influence of family status shows only very small, and generally statistically insignificant, effects for each cohort. However, the influence of race shows a changing pattern of significance. The effect of changing the reference characteristic from nonblack to black increases

Table 4.1

TWO-YEAR RESERVE ATTRITION PROBABILITIES: LOSSES TO CIVILIAN LIFE AMONG MALES IN THE ARMY NATIONAL GUARD, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.18	0.25	0.28
Race			
<i>Nonblack</i>	0.18	0.25	0.28
Black	0.23*	0.24	0.25*
Education			
<i>High school graduate</i>	0.18	0.25	0.28
High school nongraduate	0.31*	0.39*	0.41*
Age			
Less than 18 years	0.15*	0.20*	0.22*
18 to 20 years	0.18	0.25	0.28
21 years or older	0.25*	0.33*	0.34*
Family status			
<i>Single, no dependents</i>	0.18	0.25	0.28
Single, with dependents	0.18	0.27	0.31*
Married, no dependents	0.21*	0.28*	0.29
Married, with dependents	0.19	0.25	0.30
AFQT score			
Category I	0.12*	0.16*	0.17*
Category II	0.14*	0.19*	0.19*
Category III	0.18	0.25	0.28
Category IV	0.25*	0.33*	0.35*
Interactions			
Black, high school nongraduate	0.35*	0.39	0.40*
Black, less than 18 years old	0.18	0.22	0.22
Black, 21 years or older	0.28	0.31	0.31

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

attrition in FY80 but decreases attrition in FY82. This may be partly due to the renorming problem in FY80 that wrongly classified Category IV as Category III, so we may not be comparing the same mental category groups.

Perhaps the major change from FY80 to FY82 is in the level of attrition for exactly similar individuals. The attrition probability for

our reference individual increases substantially from 18 percent in FY80 to 28 percent in FY82. In other words, holding all characteristics of our reference individual constant (single, nonblack, high school graduate, 18 to 20 years old, Category III), we find a sharp increase in the probability of attriting within two years of enlistment.

Turning to males in the Army Reserve (Table 4.2), we find that the results are markedly similar to the Guard results for FY80 and FY81. For example, for the FY80 and FY81 cohorts, the attrition rate for our reference individual is virtually identical for guardsmen and reservists. With minor exceptions, the influence on attrition of each characteristic is also similar for guardsmen and reservists. For instance, education, aptitude, and age are significant for both groups and show similar effects. Marital status and dependency generally show weak or no effects. We also see the same anomaly regarding the effect of race in the different cohorts, although it is not as pronounced as in the Guard. To the extent that there are differences, age and aptitude appear to influence attrition for guardsmen to a greater degree than for reservists.

Reserve and Guard attrition rates both show similar increases between FY80 and FY81. However, in FY82, a major discrepancy appears between the Guard and reserve. The reserve attrition rate for the reference individual (37 percent) is significantly higher than the Guard rate (28 percent). A possible explanation for this lies in the policy change implemented by the Army Reserve affecting the method of discharging Army Reserve recruits from units. In 1983, the Army Reserve adopted a policy called "wrench up," which eased procedures for dismissing unproductive recruits. Because of its timing, this policy change would have its largest effect on the FY82 cohort. It could at least partially explain the large increase in attrition in FY82. We offer some plausible reasons for the increase in attrition rates across cohorts for both the Guard and reserve. The simplest explanation is that the components adopted more stringent standards. More stringent standards might be the result of an explicit policy decision linked to economic and recruiting conditions, to lower demand for trained recruits, or to demands for higher-quality trained recruits. Higher attrition might also be linked to changes in unemployment.

We will first explore the relationships among attrition, unemployment, and cohort quality. Unemployment rates changed considerably both during the time of enlistment and the subsequent two years for the three cohorts. Each successive cohort had higher attrition, had higher unemployment rates at entrance, and generally faced higher unemployment rates during their first two years (Table 4.3).

Table 4.2

TWO-YEAR RESERVE ATTRITION PROBABILITIES: LOSSES TO CIVILIAN LIFE AMONG MALES IN THE ARMY RESERVE, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.19	0.26	0.37
Race			
<i>Nonblack</i>	0.19	0.26	0.37
Black	0.22*	0.28*	0.36
Education			
<i>High school graduate</i>	0.19	0.26	0.37
High school nongraduate	0.31*	0.37*	0.47*
Age			
Less than 18 years	0.16*	0.25	0.33*
18 to 20 years	0.19	0.26	0.37
21 years or older	0.21*	0.27	0.39*
Family status			
Single, no dependents	0.19	0.26	0.37
Single, with dependents	0.18	0.22	0.39
Married, no dependents	0.19	0.28	0.39
Married, with dependents	0.18	0.26	0.38
AFQT score			
Category I	0.13*	0.20*	0.23*
Category II	0.16*	0.22*	0.25*
Category III	0.19	0.26	0.37
Category IV	0.22*	0.29*	0.38
Interactions			
Black, high school nongraduate	0.33	0.40	0.50
Black, less than 18 years old	0.19	0.26	0.30
Black, 21 years or older	0.22*	0.28	0.36

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, *holding all other characteristics unchanged*.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

We had hypothesized earlier that during periods of higher unemployment, the services might feel less constrained in their discharge decisions because larger numbers are likely to enlist and replacement costs are likely to be considerably lower. Although the rising attrition rates between the FY80 and FY82 cohorts are consistent with rising unemployment rates, the enlistment cohort quality increased only a little

during this period for the Guard. This tends to rule out any strong connection between attrition standards and cohort quality for the Guard.

Standards can, of course, be tightened independent of economic conditions or cohort quality, simply to increase the quality of individuals passing to the units or to reduce trained strength. No evidence is available to indicate such a change in policy for the Guard. For the reserve, however, both enlistment cohort quality and the size of the cohort increased significantly between FY80 and FY82. Thus, not only was the quality better, but there were more individuals from which to choose; this lends support to the "creaming" hypothesis.

A second hypothesis for higher attrition lies in the characteristics of the cohorts entering under differing economic conditions. Since we have accounted for the effect of measured variables, there would have to be differences in unmeasured factors across cohorts entering in periods of higher unemployment. One factor that might change is taste for the military. Individuals entering in times of higher unemployment may have lower commitment to military service and higher attrition rates.

Another factor that may change is civilian job status. More individuals are unemployed or hold marginal jobs at the time of enlistment. This may indicate that this group will be more likely to undergo job changes and possible migration during the first two years of enlistment. During periods of high unemployment, job conflicts may be more often resolved by separating because of the limited choice of other jobs.

Table 4.3

UNEMPLOYMENT CONDITIONS FOR THREE
ENLISTMENT COHORTS

Enlistment Cohort	Average Unemployment Rate at Entrance	Average Unemploy- ment Rate During First Term After Enlistment
FY80	6.8	7.8
FY81	7.4	8.9
FY82	9.1	9.1

Two-Year Attrition: Females

Tables 4.4 and 4.5 present corresponding results for female two-year attrition for the Army National Guard and Army Reserve, respectively. The most striking difference is the significantly higher attrition for otherwise similar reference individuals. For example, our reference female who is identical in all other measurable respects to our

Table 4.4

TWO-YEAR RESERVE ATTRITION PROBABILITIES: LOSSES TO CIVILIAN LIFE AMONG FEMALES IN THE ARMY NATIONAL GUARD, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.44	0.49	0.44
Race			
<i>Nonblack</i>	0.44	0.49	0.44
Black	0.36*	0.36*	0.34*
Education			
<i>High school graduate</i>	0.44	0.49	0.44
High school nongraduate	0.62*	0.66*	0.56*
Age			
Less than 18 years	0.34*	0.40*	0.46
18 to 20 years	0.44	0.49	0.44
21 years or older	0.41	0.47	0.49*
Family status			
Single, no dependents	0.44	0.49	0.44
Single, with dependents	0.47	0.55	0.51*
Married, no dependents	0.51*	0.50	0.54*
Married, with dependents	0.51*	0.58*	0.49
AFQT score			
Category I	0.27*	0.34*	0.31*
Category II	0.38*	0.40*	0.34*
Category III	0.44	0.49	0.44
Category IV	0.51	0.52	0.47
Interactions			
Black, high school nongraduate	0.52	0.55	0.51
Black, less than 18 years old	0.33	0.35	0.33
Black, 21 years or older	0.31	0.33	0.32*

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

reference male has Guard attrition rates for FY80, FY81, and FY82 of 44, 49, and 44 percent compared with 18, 25, and 28 percent for males. For the Army Reserve, the comparable percentages are 35, 41, and 45 for women and 19, 26, and 37 for men.

We had pointed out earlier a number of reasons why women might have higher attrition rates than men. These include earlier marriage

Table 4.5

TWO-YEAR RESERVE ATTRITION PROBABILITIES: LOSSES TO CIVILIAN LIFE AMONG FEMALES IN THE ARMY RESERVE, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.35	0.41	0.45
Race			
<i>Nonblack</i>	0.35	0.41	0.45
Black	0.27*	0.29*	0.31*
Education			
<i>High school graduate</i>	0.35	0.41	0.45
High school nongraduate	0.48*	0.51*	0.46
Age			
Less than 18 years	0.36	0.43	0.47
18 to 20 years	0.35	0.41	0.45
21 years or older	0.33	0.37*	0.43
Family status			
Single, no dependents	0.35	0.41	0.45
Single, with dependents	0.36	0.46	0.42
Married, no dependents	0.38	0.47*	0.54*
Married, with dependents	0.35	0.48*	0.51*
AFQT score			
Category I	0.25*	0.26*	0.34*
Category II	0.31*	0.36*	0.38*
Category III	0.35	0.41	0.45
Category IV	0.36	0.41	0.43
Interactions			
Black, high school nongraduate	0.41	0.38	0.30
Black, less than 18 years old	0.26	0.32	0.30
Black, 21 years or older	0.22	0.25	0.28

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, *holding all other characteristics unchanged*.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

and increased migration, childbearing and more childrearing responsibility, increased spousal conflict from reserve service, and possible differences in adapting to the physical requirements of training.

The attrition pattern for women for the three cohorts shows rising trends similar to men except for a decline in the FY82 attrition rate for women in the Guard. However, the men generally experienced larger attrition increases for similar individuals. For example, as Table 4.5 shows, between FY80 and FY82 attrition rates for reference females in the Army Reserve increased from 35 percent to 45 percent (a relative increase of 28.5 percent), whereas male reservists experienced an increase from 19 percent to 37 percent (a relative increase of 94.7 percent).

The Guard also shows somewhat higher attrition levels for similar women than the Army Reserve, at least for the FY80 and FY81 cohorts. This may be due to the different job opportunities that are available for women in each of the components.

Education, aptitude, and race show the most marked effects on attrition for women. As was true for males, education and aptitude distinguish strongly between those staying and those leaving. However, unlike the men's results, the effects of race show very strong and consistent effects across the three cohorts. Changing the reference characteristic from nonblack to black markedly decreases attrition rates for women in both components.

Being married also appears to be more strongly associated with higher attrition rates for women than for men. Age also shows a different gender pattern. When compared with the reference group—those aged 18 to 20 years—being older (21 years and over) increases attrition in men and generally lowers attrition in women. However, the age effects are generally less pronounced for women than for men.

ANALYZING THE TIMING OF ATTRITION

We have thus far examined overall attrition, i.e., losses during the first two years of service regardless of the timing of attrition. In this section, we develop separate attrition models for two periods: from enlistment to the completion of training and from the completion of training to the end of the second year. The models allow us to test whether different influences seem to be operating during these periods.

Males

Tables 4.6 and 4.7 present the empirical results from the pretraining and training model for male guardsmen and reservists. The most striking pattern in the results is the difference in both the level and the determinants of attrition between the Guard and reserve. There is a marked difference in the attrition rate for similar reference individuals

Table 4.6

PRETRAINING AND TRAINING RESERVE ATTRITION: LOSSES TO CIVILIAN LIFE AMONG MALES IN THE ARMY NATIONAL GUARD, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.13	0.18	0.21
Race			
<i>Nonblack</i>	0.13	0.18	0.21
Black	0.14	0.15*	0.17*
Education			
<i>High school graduate</i>	0.13	0.18	0.21
High school nongraduate	0.22*	0.27*	0.29*
Age			
Less than 18 years	0.11*	0.15*	0.18*
18 to 20 years	0.13	0.18	0.21
21 years or older	0.20*	0.25*	0.26*
Family status			
Single, no dependents	0.13	0.18	0.21
Single, with dependents	0.13	0.19	0.23
Married, no dependents	0.16*	0.21*	0.23*
Married, with dependents	0.15*	0.19	0.24*
AFQT score			
Category I	0.09*	0.11*	0.13*
Category II	0.10*	0.13*	0.14*
Category III	0.13	0.18	0.28
Category IV	0.19*	0.24*	0.25*
Interactions			
Black, high school nongraduate	0.21	0.25	0.26
Black, less than 18 years old	0.13	0.15*	0.16*
Black, 21 years or older	0.19*	0.22	0.22

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

in the two components (e.g., 13 percent in the Guard versus 6 percent in the reserve in the FY80 cohort), and this difference becomes larger over time (21 percent versus 8 percent in the FY82 cohort).

The variables influencing attrition also appear to be different for the two components. Similar to the two-year results, education, age, and aptitude show strong influence on attrition probabilities for the Guard. Those who are better educated, of higher aptitude, and younger have lower attrition probabilities. Race and marital status also show weaker significance with single men and blacks having generally lower attrition. In contrast, for the reserve, neither education, marital status, race, nor aptitude scores consistently discriminate statistically between those who leave and those who stay in the training attrition model. Only a single variable—age younger than 18 years—shows a consistent, statistically significant effect. The results suggest either that the Army Reserve exerts less discrimination during the training period than the National Guard or that enlistees in the Guard elect to leave the system much earlier.

Three hypotheses may help to explain the markedly differing training attrition patterns by component for similar individuals:

- First, the training standards and the qualitative and performance standards of the two components may differ. Training standards may differ because each component requires its own particular skill mix: combat skills for the Guard and combat support skills for the reserve. Differences in qualitative and performance standards may also stem from pressures to meet end-strength, and each component may raise or lower standards to meet its own needs.⁵
- The second hypothesis concerns the consistency of the data recorded at enlistment for the Guard and reserve. In these years, Guard enlistees were given aptitude tests by Guard recruiters, whereas reserve personnel were cycled through the Armed Forces Entrance and Examining Stations (AFEES).⁶

⁵Differences in qualitative and performance standards are not obvious at first, since active, Guard, and reserve trainees attend both boot camp and AIT together. Since instructors presumably do not know the affiliation of the individual trainees, they are likely to enforce standards uniformly for all. Differentiation may take place once the enlistees have been referred to component personnel at the training bases, who make the attrition and recycling decisions. The policies governing these decisions come from the National Guard Bureau (NGB) and state bureaus for the Guard and from the Office of the Chief of Army Reserves for the reserve. However, it is difficult to obtain other than anecdotal evidence to support these conjectures.

⁶Guard nonprior service enlistees began AFEES processing in FY85.

Table 4.7

**PRETRAINING AND TRAINING RESERVE ATTRITION: LOSSES TO CIVILIAN
LIFE AMONG MALES IN THE ARMY RESERVE, FY80-FY82**

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.06	0.07	0.08
Race			
<i>Nonblack</i>	0.06	0.07	0.08
Black	0.07	0.09	0.08
Education			
<i>High school graduate</i>	0.06	0.07	0.08
High school nongraduate	0.07	0.08	0.09*
Age			
Less than 18 years	0.10*	0.16*	0.13*
18 to 20 years	0.06	0.07	0.08
21 years or older	0.06	0.07	0.08
Family status			
<i>Single, no dependents</i>	0.06	0.07	0.08
Single, with dependents	0.05	0.05	0.08
Married, no dependents	0.06	0.08	0.08
Married, with dependents	0.06	0.06	0.07
AFQT score			
Category I	0.08	0.11*	0.12*
Category II	0.07	0.08	0.09*
Category III	0.06	0.07	0.08
Category IV	0.06	0.07	0.08
Interactions			
Black, high school nongraduate	0.05*	0.07*	0.10
Black, less than 18 years old	0.14*	0.23*	0.17*
Black, 21 years or older	0.05	0.08	0.07

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

Test conditions were probably more uniform in the latter case. If so, biased Guard test scores may result in different training attrition levels for individuals who appear to have similar characteristics. However, given the overall composition of the

Guard, the bias is likely to be rather small and unlikely to explain the rather large differences in attrition.

- Third, the Guard and reserve preenlistment screening may differ. Individuals from each component may attend a weekend drill before enlistment. If the reserve is better at providing information relevant to the training period, this may lead to lower training attrition. However, this would run counter to the evidence of high rates of posttraining attrition in the reserve.
- Fourth, the reporting of losses by the components may differ in timing. If the Army Reserve is slower to report losses, then some training attrition may be classified in the posttraining period. However, there is no direct evidence to support this hypothesis.

The posttraining results are presented in Tables 4.8 and 4.9. Unlike the previous result, the reserve posttraining pattern shows that education, age, and mental category are statistically significant and strongly influence explaining attrition. For the Guard, a similar pattern holds as well, although the attrition probabilities are much smaller.

Two hypotheses may help explain the difference in posttraining attrition for the two components. One can argue that the reserve may follow a more lenient training policy and allow units to make the attrition decisions as opposed to the more stringent training attrition policy adopted by the Guard. The inverse relationship between training and posttraining attrition patterns seems to lend some support to the hypothesis that the training standards of the two components differ. If less screening is done during training, then it is likely that higher involuntary posttraining attrition will result. If this is indeed so, then, at first glance, it seems that the Guard policy is more efficient. However, it is difficult to judge which policy is preferable without more information on the costs of "false positives" (letting someone stay who should have been dropped) and "false negatives" (discharging someone who should have been kept) and on the overall ability of unit commanders to discriminate successfully good from bad.

The second hypothesis focuses on the reasons for voluntary separation. If, as evidence suggests, Guard units are more widespread throughout the country, it may be easier for enlistees to transfer to other units, should they move, than in the reserve, where the only option might be to separate. (We had shown earlier that young individuals have high rates of job changes and migration.) An alternative explanation might be that the Guard attracts a different type of individual, one who, having completed training, is much more likely to

Table 4.8

POSTTRAINING ATTRITION TO CIVILIAN LIFE AMONG MALES
IN THE ARMY NATIONAL GUARD, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.06	0.07	0.07
Race			
<i>Nonblack</i>	0.06	0.07	0.07
Black	0.09*	0.10*	0.07
Education			
<i>High school graduate</i>	0.06	0.07	0.07
High school nongraduate	0.11*	0.12*	0.12*
Age			
Less than 18 years	0.05*	0.05*	0.04*
18 to 20 years	0.06	0.07	0.07
21 years or older	0.06	0.07	0.07
Family status			
Single, no dependents	0.06	0.07	0.07
Single, with dependents	0.06	0.08	0.08*
Married, no dependents	0.06	0.07	0.06
Married, with dependents	0.05	0.06*	0.06*
AFQT score			
Category I	0.05*	0.05*	0.04*
Category II	0.05*	0.06*	0.05*
Category III	0.06	0.07	0.07
Category IV	0.07*	0.09*	0.09*
Interactions			
Black, high school nongraduate	0.15	0.15	0.15
Black, less than 18 years old	0.06*	0.06	0.05
Black, 21 years or older	0.10	0.09	0.08

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, *holding all other characteristics unchanged*.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

stay. This latter explanation is, of course, purely conjectural but cannot be entirely ruled out.

Females

Tables 4.10 to 4.13 show that the different patterns in training and posttraining attrition hold for females as well. The Guard results show a high level of variable discrimination during training with race, education, marital status, and aptitude scores—and to a lesser extent, age—all being significant discriminators. During the posttraining period, the attrition is nearly random, with no variable showing consistently statistical significance. The Army Reserve results are similar to the results discussed above for the men. During training, only race and age show consistent significant effects; during the posttraining period, however, education, aptitude, race, age, and marital status show relatively consistent, statistically significant effects.

PREDICTING COHORT ATTRITION

We have noted above the rising cohort attrition rates for both the Guard and reserve from FY80 to FY82. This increase occurred despite a marked increase in enlistment cohort quality, at least for the reserve, during this time. Instead of rising cohort attrition, one would have expected falling or stable cohort attrition on the basis of our earlier findings. The difference between actual rates and expected rates is estimated in Table 4.14. Expected rates are generated by using the estimated regression coefficients from the FY80 model to calculate probabilities for individuals in the FY81 and FY82 cohorts and then averaging across all individuals. This assumes that attrition probabilities stay constant over the cohorts and that differences in overall attrition levels arise only from differences in cohort composition. Essentially, it gives estimates of FY81 and FY82 attrition assuming that standards, unmeasured cohort characteristics, and the relationship between measured characteristics and the likelihood of attrition remain unchanged.

The results for males show that actual attrition levels differ from expected levels by at least 20 percent (relatively) and as much as 63 percent. For three of the four estimates, the relative difference is in the 20 to 30 percent range, but the FY82 cohort error level for the reserve is much larger, showing at least partly the effect of a strong policy intervention. These results show that attrition models based on analysis of a single cohort year using variables available on personnel files are probably inadequate for predicting future attrition rates. Rather, models that incorporate policy effects, currently unmeasured characteristics, and the effects of the economic cycles are needed. Even then, the models may not be useful in predicting attrition rates if

Table 4.9

POSTTRAINING ATTRITION TO CIVILIAN LIFE AMONG MALES
IN THE ARMY RESERVE, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.13	0.17	0.28
Race			
<i>Nonblack</i>	0.13	0.17	0.28
Black	0.17*	0.18	0.27
Education			
<i>High school graduate</i>	0.13	0.17	0.28
High school nongraduate	0.25*	0.29*	0.38*
Age			
Less than 18 years	0.10*	0.11*	0.19*
18 to 20 years	0.13	0.17	0.28
21 years or older	0.15*	0.18	0.31*
Family status			
Single, no dependents	0.13	0.17	0.28
Single, with dependents	0.12	0.17	0.31
Married, no dependents	0.13	0.19	0.30
Married, with dependents	0.13	0.19	0.31
AFQT score			
Category I	0.08*	0.10*	0.12*
Category II	0.11*	0.13*	0.16*
Category III	0.13	0.17	0.28
Category IV	0.16*	0.21	0.30*
Interactions			
Black, high school nongraduate	0.30	0.34	0.39
Black, less than 18 years old	0.11	0.09*	0.15*
Black, 21 years or older	0.17	0.19	0.29

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

there are structural differences between cohorts. The results for females show smaller relative errors—varying from 5 to 23 percent.

A similar exercise can be carried out for FY82, using attrition coefficients estimated for FY81 (Table 4.15). Here, estimates of expected and actual rates match fairly closely for the Guard, but the Army

Table 4.10

**PRETRAINING AND TRAINING RESERVE ATTRITION: LOSSES TO CIVILIAN
LIFE AMONG FEMALES IN THE ARMY NATIONAL GUARD, FY80-FY82**

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.37	0.38	0.37
Race			
<i>Nonblack</i>	0.37	0.38	0.37
Black	0.28*	0.29*	0.27*
Education			
<i>High school graduate</i>	0.37	0.38	0.37
High school nongraduate	0.53*	0.54*	0.48*
Age			
Less than 18 years	0.27*	0.35	0.40
18 to 20 years	0.37	0.38	0.37
21 years or older	0.34	0.38	0.44*
Family status			
<i>Single, no dependents</i>	0.37	0.38	0.37
Single, with dependents	0.39	0.42	0.39
Married, no dependents	0.44*	0.43	0.47*
Married, with dependents	0.45*	0.49*	0.42
AFQT score			
Category I	0.24*	0.26*	0.25*
Category II	0.31*	0.31*	0.29*
Category III	0.37	0.38	0.37
Category IV	0.45*	0.42	0.39
Interactions			
Black, high school nongraduate	0.41	0.46	0.41
Black, less than 18 years old	0.27	0.29	0.31
Black, 21 years or older	0.26	0.26	0.28*

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

Reserve again shows very large errors, suggesting the strong influence of the reserve policy for the FY82 cohort.

Table 4.11

PRETRAINING AND TRAINING RESERVE ATTRITION: LOSSES TO CIVILIAN
LIFE AMONG FEMALES IN THE ARMY RESERVE, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.11	0.13	0.13
Race			
<i>Nonblack</i>	0.11	0.13	0.13
Black	0.08*	0.09*	0.09*
Education			
<i>High school graduate</i>	0.11	0.13	0.13
High school nongraduate	0.12	0.12	0.20*
Age			
<i>Less than 18 years</i>	0.18*	0.25*	0.19*
<i>18 to 20 years</i>	0.11	0.13	0.13
21 years or older	0.12	0.12	0.12
Family status			
<i>Single, no dependents</i>	0.11	0.13	0.13
Single, with dependents	0.24	0.12	0.12
Married, no dependents	0.10	0.14	0.16
Married, with dependents	0.11	0.16	0.14
AFQT score			
Category I	0.09	0.11	0.17
Category II	0.10	0.13	0.15
<i>Category III</i>	0.11	0.13	0.13
Category IV	0.11	0.12	0.10*
Interactions			
Black, high school nongraduate	0.07	0.12*	0.16
Black, less than 18 years old	0.22*	0.15	0.12
Black, 21 years or older	0.08	0.08	0.07

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, holding all other characteristics unchanged.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

Table 4.12

POSTTRAINING ATTRITION TO CIVILIAN LIFE AMONG FEMALES
IN THE ARMY NATIONAL GUARD, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.09	0.11	0.07
Race			
<i>Nonblack</i>	0.09	0.11	0.07
Black	0.10	0.07*	0.06
Education			
<i>High school graduate</i>	0.09	0.11	0.07
High school nongraduate	0.12	0.14	0.09
Age			
Less than 18 years	0.09	0.05*	0.06
18 to 20 years	0.09	0.11	0.07
21 years or older	0.09	0.09	0.06
Family status			
<i>Single, no dependents</i>	0.09	0.11	0.07
Single, with dependents	0.09	0.13	0.14*
Married, no dependents	0.09	0.07*	0.07
Married, with dependents	0.08	0.09	0.07
AFQT score			
Category I	0.05*	0.08	0.06
Category II	0.08	0.09	0.05*
Category III	0.09	0.11	0.07
Category IV	0.08	0.09	0.08
Interactions			
Black, high school nongraduate	0.12	0.08	0.09
Black, less than 18 years old	0.07	0.06	0.03
Black, 21 years or older	0.06	0.07	0.05

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in italics. In every case, we show the attrition probability for an individual with the given characteristic, *holding all other characteristics unchanged*.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

Table 4.13

POSTTRAINING ATTRITION TO CIVILIAN LIFE AMONG FEMALES
IN THE ARMY RESERVE, FY80-FY82

Characteristic	FY80	FY81	FY82
Average attrition probability ^a	0.25	0.27	0.31
Race			
<i>Nonblack</i>	0.25	0.27	0.31
Black	0.20*	0.19*	0.22*
Education			
<i>High school graduate</i>	0.25	0.27	0.31
High school nongraduate	0.36*	0.40*	0.26* ^b
Age			
Less than 18 years	0.21*	0.20*	0.27
18 to 20 years	0.25	0.27	0.31
21 years or older	0.21*	0.23*	0.31
Family status			
Single, no dependents	0.25	0.27	0.31
Single, with dependents	0.21	0.34	0.29
Married, no dependents	0.28	0.33*	0.38*
Married, with dependents	0.24	0.32*	0.37*
AFQT score			
Category I	0.17*	0.15*	0.18*
Category II	0.22*	0.22*	0.23*
Category III	0.25	0.27	0.31
Category IV	0.25	0.29	0.33
Interactions			
Black, high school nongraduate	0.36	0.25	0.15
Black, less than 18 years old	0.13	0.17	0.18
Black, 21 years or older	0.16	0.18	0.21

^aOf individuals with reference characteristics: nonblack, high school graduate, 18 to 20 years old, single, Category III. These characteristics are shown in *italics*. In every case, we show the attrition probability for an individual with the given characteristic, *holding all other characteristics unchanged*.

^bSmall sample size.

*Differs significantly from the reference category at the 0.05 level, two-tailed test.

Table 4.14

ACTUAL AND EXPECTED ATTRITION RATES, FY81 AND
FY82 COHORTS, USING FY80 COEFFICIENTS
(In percent)

	FY81		FY82	
	Males	Females	Males	Females
Army National Guard				
Actual attrition rate	29.5	44.6	30.2	42.9
Expected attrition rate using FY80 regression coefficients	24.1	41.0	23.6	40.7
Relative difference (percent)	+20.8	+8.8	+28.0	+5.4
Army Reserve				
Actual attrition rate	31.1	37.9	37.2	38.7
Expected attrition rate using FY80 regression coefficients	24.1	33.8	22.7	31.6
Relative difference (percent)	+29.1	+12.1	+63.9	+22.5

Table 4.15

ACTUAL AND EXPECTED ATTRITION RATES,
FY82 COHORT, USING FY81 COEFFICIENTS
(In percent)

	FY82	
	Males	Females
Army National Guard		
Actual attrition rate	30.2	42.9
Expected attrition rate using FY81 regression coefficients	29.1	44.0
Relative difference (percent)	+3.8	-2.5
Army Reserve		
Actual attrition rate	37.2	38.7
Expected attrition rate using FY81 regression coefficients	29.6	36.1
Relative difference (percent)	+25.7	+7.2

V. SUMMARY AND FUTURE RESEARCH

The theoretical framework outlined in Sec. II stressed that the attrition decision depends crucially on both the informed nature of the original enlistment decision and the probability of changes in employment, residence, household composition, and economic conditions after enlistment. We identified testable hypotheses regarding the probable relationships between variables such as sex, race, education, aptitude, age, unemployment, and attrition. The results presented in the preceding section provide substantial support for our hypotheses. We were able to test directly the effects of the demographic variables; the cohort results also provide some plausible evidence of the effect of changing economic conditions on attrition. The effects of each of these variables are discussed below. One of the major conclusions of our research is that economic factors and institutional policies are extremely important determinants of attrition across different cohorts. Although one can predict the relative attrition risk associated with changes in composition or quality, the predictive power of such models is not good. One needs to account for, as far as possible, changes in component policies or training standards as well as the effect of changing economic conditions on both the entering cohorts and the component.

SUMMARY OF ATTRITION RISKS

Nonprior service enlistees entering the Army National Guard and Army Reserve differ considerably in their *relative* risk of early attrition. These relative differences can generally be predicted to some degree on the basis of gender, educational achievement, aptitude scores, race, and age.

The characteristic that makes the largest consistent difference in attrition risk is gender (Table 5.1). Women are at much higher risk of attrition than similar males. However, the gap between male and female attrition narrows considerably between FY80 and FY82. There are several explanations for higher attrition risks for women. Women may break reserve commitments more often because they migrate more often and change jobs and marital status more frequently than men of similar age. Moreover, both marriage and jobs for women may more frequently lead to conflicts with the reserve commitment. Marriage will more often conflict with reserve service because of pregnancy and greater responsibility for home and children. Women may also

Table 5.1

**ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN
WITH SIMILAR CHARACTERISTICS^a**

Gender and Service	Cohort		
	FY80	FY81	FY82
Army Guard			
Men	0.18	0.25	0.28
Women	0.44	0.49	0.44
Army Reserve			
Men	0.19	0.26	0.37
Women	0.35	0.41	0.45

^aSingle, high school graduate, nonblack, 18 to 20 years of age, Category III.

encounter more job conflicts with the reserve commitment because of more frequent weekend work and less control over work schedules and hours.

Moreover, women will be less prepared by previous experience than men for meeting training standards in basic training and may also be less prepared for skill training if nontraditional skills are chosen by women. In terms of our theory, women will encounter more "experience" characteristics on the reserve job than men. Thus, the decision to join the reserve is less grounded in known experience, poses more uncertainty, and will be more easily reversed.

The characteristics that account for the next largest consistent differences in attrition are education and aptitude category (Tables 5.2 and 5.3). The direction of these effects is similar for men and women—more education and higher aptitude are associated with lower attrition probabilities. Depending on the gender and cohort, a change from not having to having a high school diploma usually lowers attrition by 25 to 75 percent (relatively). Moreover, both aptitude and education exert somewhat independent effects. Among high school graduates, attrition risk for different mental category groups still differs significantly.

The three remaining variables—race, age, and marital/dependency status—show much smaller influences on attrition and generally affect attrition somewhat differently for men and women. Table 5.4 shows that race usually does not significantly affect attrition risk for men;

Table 5.2

ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN*
DIFFERING IN EDUCATIONAL ATTAINMENT

Education and Service	FY80		FY81		FY82	
	Men	Women	Men	Women	Men	Women
Army Guard						
High school graduate	0.18	0.44	0.25	0.49	0.28	0.44
Nongraduate	0.31	0.62	0.39	0.66	0.41	0.56
Army Reserve						
High school graduate	0.19	0.35	0.26	0.41	0.37	0.45
Nongraduate	0.31	0.48	0.37	0.51	0.47	0.46

*Single, nonblack, 18 to 20 years of age, Category III.

Table 5.3

ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN*
DIFFERING IN APTITUDE ATTAINMENT

Category and Service	FY80		FY81		FY82	
	Men	Women	Men	Women	Men	Women
Army Guard						
Category I	0.12	0.27	0.16	0.34	0.17	0.31
Category II	0.14	0.38	0.19	0.40	0.19	0.34
Category III	0.18	0.44	0.25	0.49	0.28	0.44
Category IV	0.25	0.51	0.33	0.52	0.35	0.47
Army Reserve						
Category I	0.13	0.25	0.20	0.26	0.23	0.34
Category II	0.16	0.31	0.22	0.36	0.25	0.38
Category III	0.19	0.35	0.26	0.41	0.37	0.45
Category IV	0.22	0.36	0.29	0.41	0.38	0.43

*Single, nonblack, 18 to 20 years of age, high school graduate.

black women, however, have significantly lower attrition. The effect of changing age from younger to older (Table 5.5) increases attrition risk for men—by a fairly sizable proportion in the Army Guard. For

Table 5.4

ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN^a
DIFFERING IN RACE

Race and Service	FY80		FY81		FY82	
	Men	Women	Men	Women	Men	Women
Army Guard						
Nonblack	0.18	0.44	0.25	0.49	0.28	0.44
Black	0.23	0.36	0.24	0.36	0.25	0.34
Army Reserve						
Nonblack	0.19	0.35	0.26	0.41	0.37	0.45
Black	0.22	0.27	0.28	0.29	0.36	0.31

^aSingle, high school graduate, 18 to 20 years of age, Category III.

women in the Guard, age matters less than for men; in the reserve, there are weak differences in the effect of age on the attrition of men and women. Women 20 and over appear to have somewhat lower attrition risks than younger women; the opposite is true for the men. Finally, the effect of changing marital status or dependency status (Table 5.6) hardly changes men's attrition risk, but being married either with or without dependents usually increases women's attrition risk by moderate amounts.

Tables 5.1 to 5.6 summarize the effect of changing a single characteristic for a typical enlistee. These differences cumulate—although in a nonlinear way—as more than one characteristic is changed at a time. This means that the attrition risk can differ substantially among groups as several characteristics change (Table 5.7). For instance, a very high-risk group would be Category III females not completing high school, ages 18 to 20. The probability of attrition during the first two years for this group ranges from 46 to 66 percent. A typical low-risk group consists of males between 18 and 20 who have completed high school and are in upper aptitude Categories I and II. Such individuals have attrition probabilities in the 12 to 25 percent range.

Attrition risk tables such as these can be generated for accession cohorts and can be used to help structure recruiting and bonus policies. They can also be used to identify groups where supplementary training methods may have the greatest payoff. The services currently use aptitude and education as the primary selection mechanisms for incentives

Table 5.5

ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN^a
DIFFERING IN AGE

Age and Service	FY80		FY81		FY82	
	Men	Women	Men	Women	Men	Women
Army Guard						
Age 17	0.15	0.34	0.20	0.40	0.22	0.46
Age 18 -20	0.18	0.44	0.25	0.49	0.28	0.44
Age 20 +	0.25	0.41	0.33	0.47	0.34	0.49
Army Reserve						
Age 17	0.16	0.36	0.25	0.43	0.33	0.47
Age 18 -20	0.19	0.35	0.26	0.41	0.37	0.45
Age 20 +	0.21	0.33	0.27	0.37	0.39	0.43

^aSingle, nonblack, high school graduate, Category III.

Table 5.6

ESTIMATED CIVILIAN ATTRITION PROBABILITIES DURING
INITIAL TWO YEARS OF SERVICE FOR MEN AND WOMEN^a
DIFFERING IN MARITAL STATUS

Marital Status and Service	FY80		FY81		FY82	
	Men	Women	Men	Women	Men	Women
Army Guard						
Single	0.18	0.44	0.25	0.49	0.28	0.44
Married, no dependents	0.21	0.51	0.28	0.50	0.29	0.54
Married, dependents	0.19	0.51	0.25	0.58	0.30	0.49
Army Reserve						
Single	0.19	0.35	0.26	0.41	0.37	0.45
Married, no dependents	0.19	0.38	0.28	0.47	0.39	0.54
Married, dependents	0.18	0.35	0.26	0.48	0.38	0.51

^aNonblack, high school graduate, 18 to 20 years of age, Category III.

Table 5.7

**ESTIMATED TWO-YEAR CIVILIAN ATTRITION PROBABILITIES
FOR SINGLE WHITE MALES AND FEMALES WITH
SPECIFIED CHARACTERISTICS**

Characteristic	Army National Guard			Army Reserve		
	FY80	FY81	FY82	FY80	FY81	FY82
Male						
High School Graduates						
18-20 years, Category I	0.12	0.16	0.17	0.13	0.20	0.23
18-20 years, Category II	0.14	0.19	0.19	0.16	0.22	0.25
18-20 years, Category III	0.18	0.25	0.28	0.19	0.26	0.37
18-20 years, Category IV	0.25	0.33	0.35	0.22	0.29	0.38
21 years or older, Category I	0.17	0.21	0.21	0.15	0.21	0.25
21 years or older, Category II	0.20	0.25	0.24	0.18	0.23	0.27
21 years or older, Category III	0.25	0.33	0.34	0.21	0.27	0.39
21 years or older, Category IV	0.33	0.41	0.41	0.25	0.30	0.41
Nongraduates						
18-20 years, Category I	0.22	0.25	0.26	0.22	0.30	0.32
18-20 years, Category II	0.25	0.31	0.30	0.27	0.32	0.34
18-20 years, Category III	0.31	0.39	0.41	0.31	0.37	0.47
18-20 years, Category IV	0.41	0.47	0.49	0.35	0.40	0.49
21 years or older, Category I	0.30	0.33	0.32	0.25	0.31	0.34
21 years or older, Category II	0.34	0.39	0.36	0.30	0.33	0.37
21 years or older, Category III	0.41	0.47	0.47	0.35	0.38	0.50
21 years or older, Category IV	0.51	0.56	0.56	0.39	0.42	0.52
Female						
High School Graduates						
18-20 years, Category I	0.27	0.34	0.31	0.25	0.26	0.34
18-20 years, Category II	0.37	0.40	0.34	0.31	0.36	0.38
18-20 years, Category III	0.44	0.49	0.44	0.35	0.41	0.45
18-20 years, Category IV	0.50	0.52	0.47	0.36	0.41	0.43
21 years or older, Category I	0.24	0.32	0.36	0.23	0.23	0.33
21 years or older, Category II	0.34	0.39	0.39	0.30	0.32	0.37
21 years or older, Category III	0.41	0.47	0.49	0.33	0.37	0.43
21 years or older, Category IV	0.47	0.50	0.52	0.34	0.37	0.42
Nongraduates						
18-20 years, Category I	0.44	0.51	0.42	0.36	0.35	0.35
18-20 years, Category II	0.56	0.58	0.45	0.44	0.47	0.39
18-20 years, Category III	0.62	0.66	0.56	0.48	0.51	0.46
18-20 years, Category IV	0.68	0.68	0.59	0.49	0.52	0.44
21 years or older, Category I	0.40	0.49	0.47	0.34	0.31	0.34
21 years or older, Category II	0.52	0.56	0.51	0.42	0.42	0.38
21 years or older, Category III	0.59	0.65	0.61	0.46	0.47	0.45
21 years or older, Category IV	0.65	0.67	0.64	0.47	0.47	0.43

and recruiter emphasis, and these results lend some support for adopting such a policy. For example, although the absolute magnitude of attrition risk increased over time for the three cohorts studied, individual characteristics related to attrition do not change over time. Recruiting and training policies can thus be developed with respect to these characteristics with a fair degree of confidence that these results will hold over time.

PREDICTING COHORT ATTRITION

We find that models developed on the basis of attrition in a single cohort can predict *relative* attrition risk but cannot accurately predict *absolute* attrition risk in different cohorts. Although education, aptitude, race, and age are important and consistent determinants of attrition in each cohort, these alone are not sufficient to develop good predictive models for other cohorts. There appear to be several reasons for this.

First, attrition discharge policies and training and performance standards may change from one year to the next shifting the overall level of attrition. There is some evidence that a policy shift to a more lenient discharge policy in the Army Reserve may partly account for the sizable increase in attrition in the FY82 cohort. The results for both components also appear consistent with increasingly tighter training standards from FY80 to FY82.

Another hypothesis consistent with the results is that rising unemployment brings enlistment cohorts with unmeasured characteristics that increase attrition risk. This could happen simply because they have less "taste" for the military, encounter more job conflicts, or because they are more likely to resolve employer conflicts by separating.

Still another hypothesis is that service training discharge policies respond to an easier recruiting environment by tightening standards and "creaming" the best from any cohort regardless of cohort quality, either intentionally or unintentionally. In the latter case, training performance might simply be "graded on the curve," so that a relatively fixed proportion of recruits are discharged regardless of quality.

DIFFERENCES BETWEEN THE ARMY GUARD AND RESERVE IN ATTRITION EFFECTS

The Army Reserve has higher overall levels (counting all losses) of separation from the component in the first two years of enlistment. The relative difference between the two components is 29.1 percent in FY80, 24.8 percent in FY81, and 33.1 percent in FY82. Three factors may help explain this higher level of separation. First, the Army Reserve has higher levels of separation to the active force and returns to the reserve force. Second, the Army Reserve takes in lower cohort quality. Third, the Army Reserve implemented an easy discharge policy in FY83, which explains a large attrition increase in the FY82 cohort. If one compares only attrition to civilian life for the Guard and reserve, and adjustment is made for differential quality, attrition levels and determinants are similar for the Guard and reserve for FY80 and FY81. This indicates that individuals were until 1982 judged by similar standards in the two components, and the environments in the two components are not sufficiently different to cause individuals to leave more frequently to civilian life.

The major difference between the two components is in the timing of attrition. The Army Guard has higher training and lower posttraining attrition; the opposite is true for the Army Reserve.

FUTURE RESEARCH

Developing improved attrition models requires work in several areas. First, we need to identify important manpower policy changes that can influence attrition levels. These policies usually involve concerns regarding budget or end-strength or changes in the ease of discharging recruits. It is often easiest to make adjustments in strength by changing attrition levels in training or early in the term of service. Such changes appear to have an important effect on cohort attrition levels and need to be identified in an analysis of cohort attrition.

It is also important to understand better several changes or adjustments that occur when enlistment cohort size or quality changes. Changes in cohort size and quality can bring different unmeasured characteristics that change expected attrition levels. The adjustment of the training process to cohorts of different sizes and quality is at best only poorly understood. Standards might be absolute or relative with regard to a particular group, and attrition levels would be different in each case.

Finally, we need to understand better the effects of changing economic conditions on reserve attrition. Changing unemployment can

both change the characteristics of incoming cohorts and directly affect attrition through civilian job opportunities.

Three research approaches would prove useful in sorting out these issues. First, analysis of additional cohorts would probably be able to untangle the effects of unemployment. Analytical approaches incorporating survivor functions would be helpful in this process.

A longitudinal survey of reservists at entry with periodic follow-ups would also be helpful in obtaining data on important variables concerning civilian life. Such an effort would probably involve collecting data from exiting reservists as well. Such data could also better document the circumstances of individuals who leave and return—an important part of reserve attrition.

Finally, it is currently not known how many individuals who leave would have stayed and performed well under slightly different training circumstances. Training schedules offer little flexibility to adapt to recruits with different problems. Some structured experimentation with more flexibility in training schedules and regimens might have large payoffs in terms of retaining a larger proportion of each cohort. Structuring such experiments during the training process and following recruits would be relatively easy.

Appendix

LOGISTIC REGRESSION COEFFICIENTS FOR THE ARMY NATIONAL GUARD AND ARMY RESERVE ATTRITION MODELS

Table A.1

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY NATIONAL GUARD
TWO-YEAR ATTRITION MODEL: LOSSES TO CIVILIAN LIFE
AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-1.51		-1.08		-0.95	
Black	0.28	6.21*	-0.05	1.19	-0.15	3.63*
High school nongraduate	0.73	25.79*	0.62	23.67*	0.57	21.22*
Less than 18 years old	-0.22	7.45*	-0.29	10.54*	-0.30	10.65*
21 years or older	0.41	10.93*	0.36	10.66*	0.28	8.47*
Single, with dependents	0.01	0.16	0.08	1.51	0.16	2.71*
Married, no dependents	0.17	2.97*	0.13	2.24*	0.05	0.87
Married, with dependents	0.05	0.92	-0.01	0.25	0.09	1.92
Category I	-0.48	6.42*	-0.61	8.69*	-0.65	9.95*
Category II	-0.30	9.57*	-0.36	12.48*	-0.48	17.39*
Category IV	0.40	10.53*	0.36	11.27*	0.33	9.73*
Black, high school nongraduate	-0.13	2.05*	0.07	1.17	0.13	2.16*
Black, less than 18 years old	-0.07	0.96	0.13	1.87	0.14	1.86
Black, 21 years or older	-0.10	1.40	-0.01	0.16	0.002	0.02

^aCoefficients for Table 4.1.

*Significant at the 0.05 level.

Table A.2

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY RESERVE
TWO-YEAR ATTRITION MODEL: LOSSES TO CIVILIAN LIFE
AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-1.47		-1.07		-0.55	
Black	0.22	3.11*	0.13	2.10*	-0.03	0.64
High school nongraduate	0.66	14.41*	0.52	14.39*	0.44	12.66*
Less than 18 years old	-0.21	4.23*	-0.04	1.08	-0.17	4.85*
21 years or older	0.17	2.78*	0.05	1.07	0.11	2.60*
Single, with dependents	-0.07	0.38	-0.19	1.16	0.11	0.84
Married, no dependents	0.02	0.20	0.12	1.42	0.09	1.19
Married, with dependents	-0.03	0.35	0.03	0.39	0.06	1.06
Category I	-0.47	3.94*	-0.29	2.96*	-0.66	7.21*
Category II	-0.20	3.58*	-0.21	5.00*	-0.55	15.42*
Category IV	0.20	3.93*	0.16	4.06*	0.06	1.53
Black, high school nongraduate	-0.16	1.40	0.01	0.07	0.13	1.59
Black, less than 18 years old	0.01	0.14	-0.04	0.42	-0.10	1.12
Black, 21 years or older	-0.19	1.96*	-0.06	0.62	-0.09	1.15

^aCoefficients for Table 4.2.

*Significant at the 0.05 level.

Table A.3

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY NATIONAL GUARD
TWO-YEAR ATTRITION MODEL: LOSSES TO CIVILIAN LIFE
AMONG FEMALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-0.24		-0.04		-0.23	
Black	-0.34	3.25*	-0.54	5.45*	-0.44	4.93*
High school nongraduate	0.74	7.60*	0.70	7.82*	0.48	5.26*
Less than 18 years old	-0.41	4.21*	-0.38	4.09*	0.08	0.91
21 years or older	-0.14	1.63	-0.07	0.81	0.21	2.69*
Single, with dependents	0.12	0.73	0.22	1.51	0.27	2.08*
Married, no dependents	0.25	1.98*	0.05	0.41	0.38	3.34*
Married, with dependents	0.28	2.07*	0.36	2.88*	0.19	1.53
Category I	-0.76	5.76*	-0.63	4.37*	-0.57	4.05*
Category II	-0.27	3.59*	-0.35	4.85*	-0.44	6.31*
Category IV	0.25	1.94	0.10	1.03	0.11	1.28
Black, high school nongraduate	-0.08	0.38	0.07	0.40	0.20	1.17
Black, less than 18 years old	0.27	1.38	0.34	1.85	-0.13	0.75
Black, 21 years or older	-0.10	0.67	-0.09	0.63	-0.29	2.27*

^aCoefficients for Table 4.4.

*Significant at the 0.05 level.

Table A.4

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY RESERVE
TWO-YEAR ATTRITION MODEL: LOSSES TO CIVILIAN LIFE
AMONG FEMALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t.stat.	Coef.	t.stat.	Coef.	t.stat.
Constant	-0.61		-0.37		-0.22	
Black	-0.38	4.42*	-0.54	7.43*	-0.58	8.59*
High school nongraduate	0.53	8.11*	0.43	6.84*	0.05	0.55
Less than 18 years old	0.03	0.41	0.08	1.06	0.10	1.31
21 years or older	-0.08	1.12	-0.18	2.77*	-0.04	0.71
Single, with dependents	0.05	0.10	0.20	0.76	-0.10	0.49
Married, no dependents	0.13	1.43	0.26	3.13*	0.39	4.28*
Married, with dependents	0.01	0.15	0.29	3.53*	0.27	3.21*
Category I	-0.50	3.64*	-0.66	3.85*	-0.44	2.86*
Category II	-0.18	3.06*	-0.19	3.24*	-0.26	4.93*
Category IV	0.03	0.43	0.02	0.34	-0.07	0.96
Black, high school nongraduate	0.10	0.87	-0.01	0.07	-0.09	0.47
Black, less than 18 years old	-0.07	0.48	0.08	0.54	-0.14	0.99
Black, 21 years or older	-0.19	1.70	-0.0003	0.003	-0.10	1.01

^aCoefficients for Table 4.5.

*Significant at the 0.05 level.

Table A.5

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY NATIONAL GUARD
PRETRAINING AND TRAINING ATTRITION MODEL: LOSSES TO
CIVILIAN LIFE AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t.stat.	Coef.	t.stat.	Coef.	t.stat.
Constant	-1.89		-1.52		-1.33	
Black	0.09	1.83	-0.21	4.61*	-0.22	5.00*
High school nongraduate	0.61	18.94*	0.50	17.35*	0.43	14.52*
Less than 18 years old	-0.19	-5.45*	-0.18	5.86*	-0.17	5.59*
21 years or older	0.52	12.29*	0.44	11.59*	0.31	8.70*
Single, with dependents	0.02	0.29	0.08	1.22	0.11	1.64
Married, no dependents	0.20	3.10*	0.17	2.71*	0.12	2.00*
Married, with dependents	0.13	2.13*	0.10	1.87	0.16	3.37*
Category I	-0.38	-4.43*	-0.56	7.17*	-0.60	8.39*
Category II	-0.27	-7.43*	-0.34	10.61*	-0.46	15.23*
Category IV	0.45	10.50*	0.34	9.66*	0.24	6.58*
Black, high school nongraduate	-0.13	-1.90	0.10	1.57	0.09	1.27
Black, less than 18 years old	0.07	0.81	0.18	2.37*	0.18	2.33*
Black, 21 years or older	-0.16	-2.00*	0.02	0.22	-0.02	0.33

^aCoefficients for Table 4.6.

*Significant at the 0.05 level.

Table A.6

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY RESERVE
PRETRAINING AND TRAINING ATTRITION MODEL: LOSSES
TO CIVILIAN LIFE AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-2.74		-2.53		-2.45	
Black	0.10	0.86	0.15	1.66	0.02	0.21
High school nongraduate	0.09	1.16	0.03	0.47	0.20	3.72*
Less than 18 years old	0.52	6.32*	0.84	13.94*	0.56	10.16*
21 years or older	0.08	0.77	-0.03	0.37	-0.02	0.26
Single, with dependents	-0.12	0.41	-0.45	1.81	-0.04	0.18
Married, no dependents	-0.06	0.37	0.06	0.49	0.03	0.24
Married, with dependents	0.07	0.51	-0.14	1.34	-0.08	0.81
Category I	0.29	1.49	0.39	2.63*	0.48	3.37*
Category II	0.15	1.66	0.08	1.25	0.14	2.53*
Category IV	0.02	0.20	-0.09	1.53	-0.04	0.60
Black, high school nongraduate	-0.36	2.70*	-0.23	1.97*	0.08	0.65
Black, less than 18 years old	0.35	2.00*	0.34	2.40*	0.29	2.00*
Black, 21 years or older	-0.30	1.89	-0.11	0.78	-0.12	0.93

^aCoefficients for Table 4.7.

*Significant at the 0.05 level.

Table A.7

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY NATIONAL GUARD
POSTTRAINING ATTRITION MODEL: LOSSES TO CIVILIAN LIFE
AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	2.81		-2.57		-2.64	
Black	0.53	7.49*	0.33	4.88*	0.11	1.62
High school nongraduate	0.07	15.00*	0.56	13.10*	0.62	13.49*
Less than 18 years old	-0.18	3.86*	-0.39	8.59*	-0.46	9.44*
21 years or older	0.004	0.07	0.02	0.30	0.05	0.84
Single, with dependents	0.01	0.06	0.06	0.66	0.21	2.07*
Married, no dependents	-0.01	0.14	-0.03	0.35	-0.15	1.65
Married, with dependents	-0.12	1.44	-0.25	3.17*	-0.15	2.01*
Category I	-0.25	2.06*	-0.42	3.62*	-0.43	3.86*
Category II	-0.18	3.69*	-0.22	4.75*	-0.27	5.84*
Category IV	0.16	2.67*	0.22	4.16*	0.36	6.30*
Black, high school nongraduate	-0.11	1.12	-0.04	0.40	0.18	1.70
Black, less than 18 years old	-0.31	2.59*	-0.05	0.45	-0.06	0.46
Black, 21 years or older	0.08	0.72	-0.06	0.59	0.06	0.55

^aCoefficients for Table 4.8.

*Significant at the 0.05 level.

Table A.8

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY RESERVE
POSTTRAINING ATTRITION MODEL: LOSSES TO CIVILIAN
LIFE AMONG MALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-1.90		-1.58		-0.94	
Black	0.28	3.49*	0.08	1.16	-0.05	0.85
High school nongraduate	0.78	15.35*	0.68	16.20*	0.43	11.31*
Less than 18 years old	-0.54	6.18*	-0.53	11.78*	-0.49	12.54*
21 years or older	0.15	2.25*	0.09	1.51	0.15	3.05*
Single, with dependents	-0.08	0.42	0.01	0.04	0.15	1.06
Married, no dependents	0.02	0.21	0.13	1.26	0.10	1.14
Married, with dependents	-0.05	0.56	0.12	1.46	0.12	1.74
Category I	-0.52	3.94*	-0.61	5.39*	-1.04	10.33*
Category II	-0.24	3.84*	-0.32	6.69*	-0.73	18.77*
Category IV	0.21	3.79*	0.26	5.82*	0.09	2.11*
Black, high school nongraduate	-0.03	0.29	0.14	1.57	0.11	1.28
Black, less than 18 years old	-0.16	1.52	-0.25	2.30*	-0.27	2.65*
Black, 21 years or older	-0.11	1.03	-0.01	0.13	-0.05	0.61

^aCoefficients for Table 4.9.

*Significant at the 0.05 level.

Table A.9

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY NATIONAL GUARD
PRETRAINING AND TRAINING ATTRITION MODEL: LOSSES TO
CIVILIAN LIFE AMONG FEMALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-0.55		-0.49		-0.55	
Black	-0.38	-3.51*	-0.42	4.10*	-0.42	4.69*
High school nongraduate	0.68	6.73*	0.64	6.98*	0.46	4.88*
Less than 18 years old	-0.44	4.29*	-0.14	1.53	0.15	1.58
21 years or older	-0.12	1.31	-0.01	0.14	0.29	3.66*
Single, with dependents	0.11	0.65	0.16	1.06	0.10	0.77
Married, no dependents	0.29	2.17*	0.19	1.57	0.42	3.56*
Married, with dependents	0.36	2.51*	0.46	3.56*	0.21	1.68
Category I	-0.59	4.24*	-0.55	3.68*	-0.55	3.84*
Category II	-0.25	3.15*	-0.32	4.23*	-0.36	5.05*
Category IV	0.35	2.61*	0.19	1.91	0.10	1.10
Black, high school nongraduate	-0.09	0.45	0.12	0.65	0.16	0.92
Black, less than 18 years old	0.38	1.85	0.15	0.79	0.01	0.06
Black, 21 years or older	0.02	0.11	-0.13	0.92	-0.28	2.15*

^aCoefficients for Table 4.10.

*Significant at the 0.05 level.

Table A.10

LOGISTIC REGRESSION COEFFICIENTS FOR ARMY RESERVE
PRETRAINING AND TRAINING ATTRITION MODEL: LOSSES
TO CIVILIAN LIFE AMONG FEMALES, FY80-FY82 COHORTS^a

Independent Variable	FY80		FY81		FY82	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	-2.11		-1.90		-1.88	
Black	-0.38	2.94*	-0.38	3.66*	-0.44	4.49*
High school nongraduate	0.11	1.13	-0.13	1.50	0.47	3.61*
Less than 18 years old	0.57	4.63*	0.83	7.77*	0.46	4.19*
21 years or older	0.10	0.97	-0.05	0.58	-0.10	1.13
Single, with dependents	0.93	1.29	-0.12	0.32	-0.09	0.31
Married, no dependents	-0.11	0.85	0.07	0.60	0.24	1.86
Married, with dependents	0.05	0.40	0.21	1.78	0.09	0.74
Category I	-0.21	1.04	-0.14	0.56	0.29	1.31
Category II	-0.11	1.21	-0.001	0.01	0.12	1.53
Category IV	-0.02	0.16	-0.13	1.64	-0.30	2.80*
Black, high school nongraduate	-0.27	1.57	0.41	2.30*	0.15	0.54
Black, less than 18 years old	0.64	2.73*	-0.26	1.30	-0.09	0.46
Black, 21 years or older	-0.13	0.78	-0.14	0.96	-0.11	0.76

^aCoefficients for Table 4.11.

*Significant at the 0.05 level.

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